Chemical Age

U.K.'s FIRST LIQUID METHANE SHIPMENT
(page 351)

VOL. 81 No. 2068

28 February 1959

For the transport of corrosive and sensitive liquids—

VALETHENE CONTAINERS

Valethene containers combine the high chemical resistance and inert properties of polyethylene with the strength, robustness and handling characteristics of universally accepted standard steel drums. Bulk transit of corrosive and sensitive liquids can now be made more conveniently, safely and economically.

The semi-rigid moulded polyethylene inner container also protects your materials from contamination and is manufactured by a new patented process. These containers are already widely used in the United States.

Manufactured entirely and solely by:

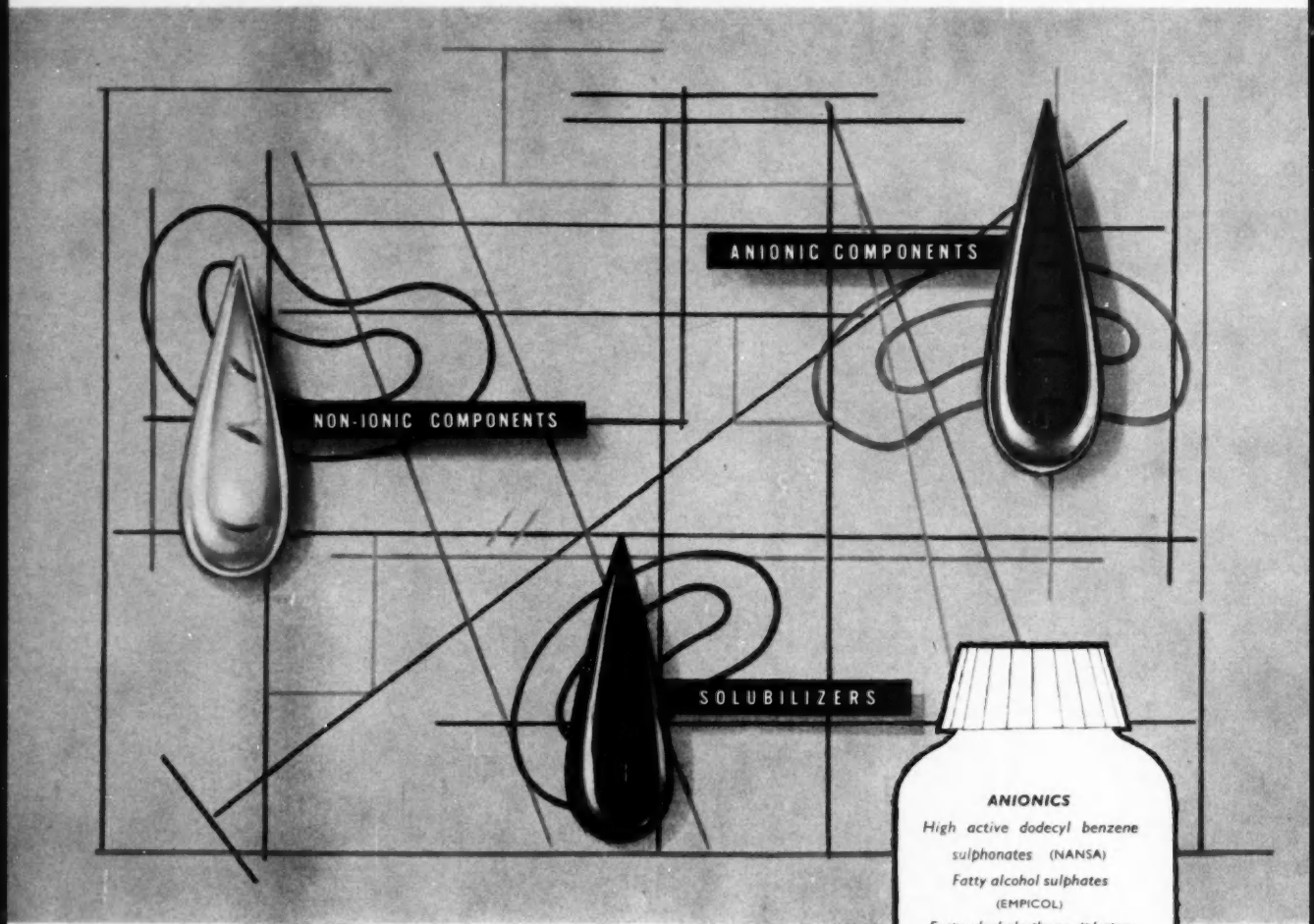
METAL CONTAINERS LTD.

METAL CONTAINERS LIMITED, 17 WATERLOO PLACE, PALL MALL, LONDON

WORKS: ELLESMERE PORT, RENFREW & CRAYFORD ASSOCIATED COMPANIES IN GT. BRITAIN & ABROAD

M-W. 129

Anionics Non-ionics Solubilizers



ANIONICS

High active dodecyl benzene sulphonates (NANSA)

Fatty alcohol sulphates (EMPICOL)

Fatty alcohol ether sulphates (EMPICOL)

NON-IONICS

Fatty acid mono- and dialkylolamides (EMPILAN)

Polyethanoxy ethers of fatty acid monoalkylolamides (EMPILAN)

Other ethylene oxide derivatives

SOLUBILIZERS

Substituted aromatic sulphonates (sodium and potassium xylene and toluene sulphonates) (ELTESOL)

for competitive LIQUID detergents

For dishes . . . fine fabrics . . . hard-surface cleaning . . . the increased popularity of liquid detergents has led to keen competition, with selective formulation a key factor in winning consumer approval.

The Marchon range of components for 'liquids' gives you the choice of many formulations, each with distinct advantages in a particular field, one or more meeting *all* your requirements. Please write for technical data, with formulation advice if required.

AGENTS & OFFICES IN PRINCIPAL CITIES OF THE WORLD
HEAD OFFICE: Whitehaven, England.
Telephone: Whitehaven 3131; Telegrams: Marchonpro, Whitehaven, Telex
LONDON OFFICE: 140 Park Lane, London, W.1.
Telephone: Mayfair 7385; Telegrams: Marchonpro, London, Telex
Member of the Albright & Wilson Group of Companies

Marchon
PRODUCTS LIMITED

Marchon's products include basic raw materials and additives for every form of domestic and industrial detergent.
MAR 11098

WORKS: ELLESMERE PORT, RENFREW & CRAYFORD
ASSOCIATED COMPANIES IN GT. BRITAIN & ABROAD
M-W. 129

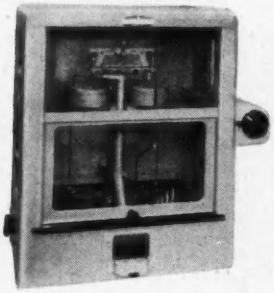
STANTON'S

NEW 1959 CATALOGUE

is your complete guide to precision balances

Here's a selection you can't afford to miss—

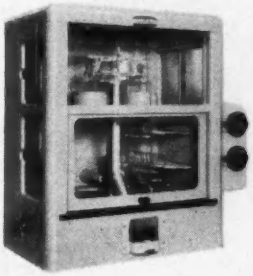
New Feature – **set of weights included**



STANTON **A.49**

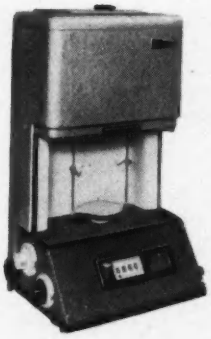
Already one of the most popular balances in our range. A set of five weights from 10-100g is now built into the case on a small turntable adjacent to the pan, for greater convenience and quicker weighing.
Capacity 200g—
Sensitivity 0.1mg.

New Feature – **Twin bankweight loading**



STANTON **B.20**

A worthy successor to Britain's first full Weight-loading Balance, this model now incorporates a new graticule and twin bank weightloading, for greater convenience and quicker weighing.
Capacity 200g—
Sensitivity 0.1mg.

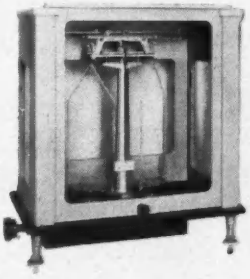


New Features –

Vernier Scale
Partial Release
STANTON ULTRAMATICS

Four models now available, all incorporating facilities for tare weighing and partial release. New numbered Vernier Scales on Models U.M.3 and U.M.10, for greater convenience and quicker weighing.
Capacity 200g—
Sensitivities 0.1mg.—1mg.

And still the best value obtainable–



STANTON **C.26**

A firm favourite in schools and University Laboratories where accuracy, dependability, and robustness are the key requirements.
Capacity 200g—
Sensitivity 0.1mg.

Our new catalogue is more informative than our press advertisement. A DEMONSTRATION will be more convincing than either

A postcard will bring a technical representative to your laboratory.

Trade Mark

Guaranteed

STANTON PRECISION BALANCES

STANTON INSTRUMENTS LTD., 119 Oxford Street, London, W.1. Telephone: Gerrard 7533/4.

A

INDEX TO ADVERTISERS

The first figures refer to advertisements in **Chemical Age Directory & Who's Who,** *the second to the current issue*

Page		Page
160	A.P.V. Co. Ltd., The	—
154	Acalor (1948) Ltd.	—
85	Accrington Brick & Tile Co. Ltd., The	—
	African Pyrethrum Technical Information Centre Ltd.	—
117	Air Trainers Link Ltd.	—
131	Albany Engineering Co. Ltd., The	—
	Albright & Wilson (Mfg.) Ltd.	—
	Alchemy Ltd.	372
86	Alginate Industries Ltd.	—
100	Allen, Edgar, & Co. Ltd.	—
118	Allen, Frederick (Poplar) Ltd.	—
	Alumina Co. Ltd., The	—
	Amalgamated Oxides (1939) Ltd.	—
	American Cyanamid	—
102	Anglo-Dal Ltd.	344
	Anthony, Mark & Sons Ltd.	—
166	Armour Chemical Industries Ltd.	—
G/Card	Ashmore, Benson, Pease & Co.	—
	Ashworth, Arthur, Ltd.	—
	Associated Electrical Instruments Ltd. Turbine-Generator Division	—
103	Associated Lead Mfrs. Ltd.	—
G/Card	Audley Engineering Co. Ltd.	—
169	Automotive Products Ltd.	—
	Avo Ltd.	—
	Baird & Tatlock Ltd.	—
143	Baker Perkins Ltd.	346
159	Balfour, Henry, & Co. Ltd.	—
	Balfour Group of Companies, The	—
120	Barclay Kellett & Co. Ltd.	—
	Bennett, H. G., & Co. (Gloves) Ltd.	—
87	Bennett, Sons & Shears Ltd.	—
G/Card	Berk, F. W., & Co. Ltd.	—
104	Bivac Air Company Ltd.	—
132	Black, B., & Son Ltd.	—
2	Blackman, Keith, Ltd.	—
197	Blundell & Crompton Ltd.	—
	Borax & Chemicals Ltd.	—
84	Borax Consolidated Ltd.	—
4	Boulton, William, Ltd.	—
97	Bourne Chemical Industries Ltd.	—
	Bowmans Chemicals Ltd.	—
119 & 147	Braby, Frederick, & Co. Ltd.	—
86	Bristol Piping Co. Ltd., The	—
	British Acheson Electrodes Ltd.	—
	British Carbo Norit Union Ltd.	—
	British Ceca Co. Ltd., The	—
	British Drug Houses Ltd., The	—
	British Dyewood Co. Ltd., The	—
146	British Ermeto Corporation Ltd.	—
Spine	British Geon Limited	—
	British Industrial Solvents	—
220	British LaBour Pump Co. Ltd.	—
	British Lead Mills Ltd.	—
Spine	British Resin Products Ltd.	—
132	British Rototherm Co. Ltd., The	—
89	British Steam Specialties Ltd., The	—
134	British Tar Products Ltd.	—
	British Thomson-Houston Co. Ltd., The	—
231	British Titan Products Co. Ltd.	—
267	Broadbent, Thomas, & Sons Ltd.	—
137	Brotherhood, Peter, Ltd.	—
	Brough, E. A., & Co. Ltd.	—
101	Bryan Donkin Co. Ltd., The	—
	Burndept Ltd.	—
132	Burnett & Rolfe Ltd.	—
162	Bush, W. J., & Co. Ltd.	—
	Buss Ltd.	—
88	Butterfield, W. P., Ltd.	—
	Butterworths Scientific Publications	—
126	Calder Vale Glassworks Ltd.	—
	Callow Rock Lime Co. Ltd., The	—
	Cambridge University Press	—
	Cannon (CP) Ltd.	—
	Carbon Dioxide Co., The	—
	Catterson-Smith, R. M., Ltd.	—
210	Causeway Reinforcement Ltd.	—
	Chapman & Hall Ltd.	—
	Chemical Age Enquiries	373 & 374
178	Chemical Construction (G.B.) Ltd.	—
	Chemical & Insulating Co. Ltd., The	—
106	Chemical Workers' Union	—
	Chemicals & Feeds Ltd.	—
	Chemidus Plastics Ltd.	—
	Chemitrade Ltd.	Cover iii
	Christy & Norris Ltd.	—
	Ciba (A.R.L.) Ltd.	—
110	Ciba Clayton Ltd.	—
	Ciech Ltd.	—
	City Engineering Co. (Boreham Wood) Ltd.	—
	Clark Ltd.	—
	Classified Advertisements	371 & 372
95	Clayton, Son & Co. Ltd.	—
142	Clydesdale Chemical Co. Ltd., The	—
	Cochran & Co. (Annan) Ltd.	—
	Cohen, George, Sons & Co. Ltd.	—
121	Cole, R. H., & Co. Ltd.	—
90	Collins Improved Firebars Ltd.	—
	Colt Ventilation Ltd.	—
	Colvin-Smith Ltd.	—
133	Comet Pump & Eng. Co. Ltd., The	—
	Constable & Co.	—
	Constructors, John Brown, Ltd.	—
	Contoura Photocopying Ltd.	—
	Controlled Convection Drying Co.	—
	Crofts (Engineers) Ltd.	—
	Cromil & Piercy Ltd.	—
	Crosfield, Joseph, & Sons Ltd.	—
99	Cruickshank, R., Ltd.	—
214	Curran, Edward, Engineering Ltd.	—
171	Cyanamid of Great Britain Ltd.	—
88	Cyclops Engineering Co. Ltd., The	—
	Cygnet Joinery Ltd.	—
	Dalglish, John, & Sons Ltd.	—
150	Danks of Netherton Ltd.	—
149	Davey & Moore Ltd.	—
173	Davey, Paxman & Co. Ltd.	—
	Dawson, McDonald & Dawson Ltd.	—
94	Derby Luminescents Ltd.	—
175	Distillers Co. Ltd., The (Chemical Div.)	—
	Distillers Co. Ltd., The (Engineering Div.)	—
163	Dorr-Oliver Co. Ltd.	—
139	Doulton Industrial Porcelains Ltd.	—
	Dowlow Lime & Stone Co. Ltd., The	—
136	Dring & Fage Ltd.	—
183	Drummond Patents Ltd.	—
151	Dryden, T., Ltd.	—
	Dupree Swift & Co. Ltd.	—
96	E.C.D. Ltd.	—
200	Electric Resistance Furnace Co. Ltd.	—
	Electro-Chemical Engineering Co. Ltd.	—
	Electronic Switchgear (London) Ltd.	—
	Electrothermal Engineering Ltd.	—
	Elga Products Ltd.	—
	Elliott, H. J., Ltd.	—
158	Elmatic	—
	Enamelled Metal Products Corporation (1933) Ltd.	—
	Engelhard Industries Ltd. (Hanovia Lamps Division)	—
111	Engelhard Industries Ltd. (Baker Platinum Division)	—
	English Glass Co. Ltd., The	—
G/Card	Erinoid Ltd.	—
	Evans, Joseph, & Sons (Wolverhampton) Ltd.	—
	Evered & Co. Ltd.	—
	Evershed & Vignoles Ltd.	—
	Extrudex Ltd.	—
90	Farnell Carbons Ltd.	—
	Fawcett, Preston & Co. Ltd.	—
124	Feltham, Walter H., & Son Ltd.	—
	Ferraris, Fred, Ltd. (Clerkenwell)	—
138	Ferris, J. & E., Ltd.	—
130	Film Cooling Towers (1925) Ltd.	—
	Fisher Governor Ltd.	—
	Foamite Ltd.	—
	Ford, T. B., Ltd.	—
	Foster Instrument Co. Ltd.	—
93	Foxboro-Yoxall Ltd.	—
	Freeman Taylor Machines Ltd.	—
198	Fuller's Earth Union Ltd., The	—
	Gallenkamp, A., & Co. Ltd.	—
	Gas Council, The	—
	General Electric Co. Ltd.	—
134	Glebe Mines Ltd.	—
218	Goodyear Pumps Ltd.	—
	Gowlands Ltd.	—
107	Graviner Mfg. Co. Ltd.	—
109	Grazebrook, M. & W., Ltd.	—
122	Greeff, R. W., & Co. Ltd.	—
	Grindley & Co. Ltd.	—
138	Haller & Phillips Ltd.	—
124	Harris (Lostock Gralam) Ltd.	370
	Hartley Electromotives Ltd.	—
	Haworth, F. (A.R.C.), Ltd.	—
144	Heathway Machinery Co. Ltd.	—
	Herbert, Alfred, Ltd.	—
	High Pressure Components Ltd.	—
	Hilger & Watts Ltd.	—
183	Holland, B. A., Eng. Co. Ltd., The	—
	Hopkin & Williams Ltd.	—
	Humphreys & Glasgow Ltd.	—
6	Hungington, Heberlein & Co. Ltd.	—
	I.C.I. Billingham	—
	I.C.I. Catalysts	—
	I.C.I. General Chemicals Solvents	—
	I.C.I. Marston Excelsior Ltd.	345
	I.C.I. Metals Titanium D.	—
	I.C.I. Plastics—Darvic	—
	I.C.I. Plastics—Fluon	—
	I.C.I. Ltd. (Plastics Division), Corvic	—
	I.C.I. (Florube) Ltd.	—
	Industrial Descaling Tools Ltd.	—
	Industrial Tapes Ltd.	—
	Infra Red Development Co. Ltd., The	—
	International Combustion Group	—

(continued on page 342)

FILTER CRUCIBLES of Porous Porcelain

Made by

The **WORCESTER ROYAL PORCELAIN CO. LIMITED**

Supplied by all recognised Laboratory Furnishers.

retain the finest precipitates and filter rapidly. They are not affected by acids, remain constant in weight within very fine limits and can be heated to high temperatures.

request with an odd twist to it ...

The above picture shows a blunger shaft which was fabricated and covered with rubber in our works. The 4″ diameter shaft is 9′ 3″ long between couplings and carries 2′ 0″ diameter x 3′ wide spirals at 2′ 0″ pitch. It is typical of the steel fabricating and rubber covering carried out at Nordac today.

NORDAC FOR:—

Rubber and ebonite linings.
Homogeneous and sheet lead work.
Rubber and lead lined pipes.
Steel plate work specially prepared for application of rubber.
Design of chemical processing plant.
Submerged combustion heating.

NORDAC CHEMICAL ENGINEERS

NORDAC LIMITED, UXBRIDGE, MIDDLESEX. UXBRIDGE 5131.

B

INDEX TO ADVERTISERS

The first figures refer to advertisements in **Chemical Age Directory & Who's Who,** *the second to the current issue*

Page		Page
127	International Furnace Equipment Co. Ltd., The	—
	Interscience Publishers Ltd.	—
	Isopad Ltd.	—
102	Jackson, J. G. & Crockatt Ltd.	—
125	Jenkins, Robert, & Co. Ltd.	
	Jenkinson, W. G., Ltd.	—
3	Jobling, James A., & Co., Ltd.	347
	Johnson, Matthey & Co. Ltd.	—
98	Johnsons of Hendon Ltd.	—
108	K.D.G. Instruments Ltd.	—
148	K.W. Chemicals Ltd.	—
	Kaylene (Chemicals) Ltd.	—
	Kellie, Robert & Sons Ltd.	343
	Kellogg International Corporation	—
110	Kernick & Son Ltd.	—
265	Kestner Evaporator & Engineering Co. Ltd.	—
	Kestner Evaporator & Engineering Co. Ltd. (*Keebush*)	—
	Kestner (Industrial Safety) Ltd.	—
130	Kier, J. L., & Co. Ltd.	—
	King, G. W., Ltd.	—
208	Kingsley & Keith Ltd.	—
184	Kleen-e-ze Brush Co. Ltd., The	—
122	Laboratory Apparatus & Glass Blowing Co.	—
224	Lambeth & Co. (Liverpool) Ltd.	—
	Langley Alloys Ltd.	—
112	Lankro Chemicals Ltd.	—
205	Laporte Chemicals Ltd.	—
114	Lavino (London) Ltd.	—
173	Leda Chemicals Ltd.	—
96	Leek Chemicals Ltd.	—
	Lees, Henry, & Co. Ltd.	—
112	Leigh & Sons Metal Works Ltd.	—
	Lennig, Charles, & Co. (Great Britain) Ltd.	348
	Lennox Foundry Co. Ltd.	—
129	Light, L., & Co. Ltd.	—
135	Lind, Peter, & Co. Ltd.	—
118	Liquid Solid Separations Ltd.	—
B/cover	London Aluminium Co. Ltd., The	—
142	London Sand Blast Decorative Glass Works Ltd., The	—
	Longman Green & Co. Ltd.	—
	Longworth Scientific Instruments Co.	—
92	Lord, John L., & Son	Cover iv
	Loughborough Glass Co. Ltd.	—
	McCarthy, T. W., & Sons Ltd.	342
	MacLellan, George, & Co. Ltd.	—
	Maine, B. Newton Ltd.	—
126	Manesty Machines Ltd.	—
177	Marchon Products Ltd.	Cover ii
108	Matthews & Yates Ltd.	—
	May & Baker Ltd.	—
	Measuring & Scientific Equipment Ltd.	—
	Medway Paper Sacks Ltd.	—
	Mervyn Instruments & Co. Ltd.	—
Front cover	Metal Containers Ltd.	Front cover
	Metafiltration Co. Ltd.	—
G/card	Metalock (Britain) Ltd.	—
126	Metcalf & Co.	—
	Metropolitan-Vickers Electrical Co. Ltd.	Cover iv
148	Middleton & Co. Ltd.	—
	Mills Packard Construction Co. Ltd.	—
	Mine Safety Appliances Co. Ltd.	—
	Mirrlees Watson Co. Ltd., The	—
140	Mirvale Chemical Co. Ltd., The	—
141	Mitchell Cotts Co. Ltd.	—
	Mond Nickel Co. Ltd., The	—
120	Monkton Motors Ltd.	—
	Monsanto Chemicals Ltd.	—
	Moritz Chemical Engineering Co. Ltd.	—
	Mulberry Co., The	—
82	Neckar Water Softener Co. Ltd.	344
115	Negretti & Zambra Ltd.	—
	New Metals & Chemicals Ltd.	—
	Newnes, George, Ltd.	—
	Nicolson, W. B. (Scientific Instruments) Ltd.	—
	Nitrate Corporation of Chile Ltd.	—
	Nordac Ltd.	341
146	Odoni, Alfred A. & Co. Ltd.	—
G/card	Oil & Colour Chemists' Association	—
	Operation Britain	—
136	Optical-Mechanical (Instruments) Ltd.	—
	Orr Products Ltd.	—
	Palfrey, William, Ltd.	—
	Pascall Engineering Co. Ltd., The	—
8	Paterson Engineering Co. Ltd., The	—
161	Peabody Ltd.	—
	Penrhyn Quarries Ltd.	—
	Permali Ltd.	—
194 & 235	Permutit Co. Ltd., The	—
G/card	Petrocarbon Developments Ltd., The	—
	Petrochemicals Ltd.	—
150	Plastic Filters Ltd.	—
	Platon, G. A., Ltd.	—
154	Podmores (Engineers) Ltd.	—
206	Polypenco Ltd.	—
223	Pool, J. & F., Ltd.	—
	Pott, Cassels & Williamson Ltd.	369
	Potter, F. W., & Soar Ltd.	—
180	Powell Duffryn Carbon Products Ltd.	—
G/card	Power-Gas Corporation Ltd., The	—
197	Prat-Daniel (Stanmore) Ltd.	—
128	Price Stutfield & Co. Ltd.	—
	Price's (Bromborough) Ltd.	—
	Prodorite Ltd.	—
	Purkis, Williams Ltd.	—
190	Pye, W. G., & Co. Ltd.	—
162	Pyrometric Equipment Co. Ltd., The	—
	Q.V.F. Ltd.	—
	Quickfit & Quartz Ltd.	—
186	Reads Ltd.	—
140	Rediweld Ltd.	—
	Research Utilities Ltd.	—
	Reynolds & Branson Ltd.	—
	Rheem Lysaght Ltd.	—
	Richmond Welding Co. Ltd.	—
	Robinson, F., & Co. Ltd.	—
G/card	Rose, Downs & Thompson Ltd.	—
153 & 188	Dr. Rosin Industrial Research Co. Ltd.	—
124	Rotometer Manufacturing Co. Ltd.	—
	S.I.C. Plastics Ltd.	—
118	S.P.E. Company Ltd.	—
113	Sandiacre Screw Co. Ltd., The	—
	Scientific Glass-Blowing Co. Ltd.	—
	Scientific Instrument Manufacturers' Association of Great Britain Ltd.	—
	Scott, Ernest, & Co. Ltd.	—
	Scott, George, & Son (London) Ltd.	—
	Sharples Process Engineers Ltd.	—
	Shaw Petrie Ltd.	—
193	Shell Chemical Co. Ltd.	—
	Shell-Mex & B.P. Ltd.	—
	Short & Mason Ltd.	—
91	Siebe, Gorman & Co. Ltd.	—
	Siemens Edison Swan Ltd.	—
	Sifam Electrical Instrument Co. Ltd.	—
	Simon, Richard, & Sons Ltd.	—
	Sipon Products Ltd.	—
128	Southern Instruments Computer Division	—
145	Spencer Chapman & Messel Ltd.	—
	Stabilag Co. Ltd., The	—
266	Stanton Instruments Ltd.	339
	Stationery Office, Her Majesty's	—
	Staveley Iron & Chemical Co. Ltd.	—
92	Steel, J. M., & Co. Ltd.	—
	Steel & Cowlishaw Ltd.	—
	Stockdale Engineering Co. Ltd.	—
	Stonehouse Paper & Bag Mills	—
	Streamline Filters Ltd.	—
	Sturge, John & E., Ltd.	—
	Sutcliffe Speakman & Co. Ltd.	—
156	Synthite Ltd.	—
149	"T.P." Chemical Engineering Co Ltd.	—
155	Taylor Rustless Fittings Co. Ltd., The	—
142	Taylor Stainless Metals Ltd.	—
152	Thermal Syndicate Ltd., The	—
	Thermo Plastics Ltd.	—
	Thompson, John (Dudley) Ltd.	—
120	Titanium Metal & Alloys Ltd.	—
	Todd Bros. (St. Helens & Widnes) Ltd.	—
144	Towers, J. W., & Co. Ltd.	—
	Triangle Valve Co. Ltd.	—
210 & 224	Tylors of London Ltd.	—
	Unicone Co. Ltd., The	—
	Unifloc Ltd.	—
	Unilever Ltd.	—
	Union Carbide Ltd.	—
	United Coke & Chemicals Co. Ltd.	—
104	United Filters & Engineering Ltd.	—
G/Card	Universal-Matthey Products Ltd.	—
	Vacu-Blast Ltd.	—
	Vaughan Crane Co. Ltd.	—
	Voss Instruments Ltd.	—
183	W.E.X. Traders Ltd.	—
	Walker, James, & Co. Ltd.	—
	Walker, P. M., & Co. (Halifax) Ltd.	—
	Wallach Bros. Ltd.	—
105	Waller, George, & Son Ltd.	—
98	Wallis, Charles, & Sons (Sacks) Ltd.	—
123	Ward, Thos. W., Ltd.	—
	Warren-Morrison Ltd.	—
152	Watson, Laidlaw & Co. Ltd.	—
	Wellington Tube Works Ltd.	—
116	Wells, A. C., & Co. Ltd.	—
220	Wengers Ltd.	—
	Whessoe Ltd.	—
	Whiffen & Sons Ltd.	—
184	Whitaker, B., & Sons Ltd.	—
123	Widnes Foundry & Engineering Co. Ltd.	—
202	Wilcox, W. H., & Co. Ltd.	—
136	Wilkinson, James, & Son Ltd.	—
94	Williams & James (Engineers) Ltd.	—
122	Wilson, Edward, & Son Ltd.	—
114	Wood, Harold, & Sons Ltd.	—
156	Worcester Royal Porcelain Co., Ltd., The	340
	Worthington-Simpson Ltd.	—
	Wynn (Valves) Ltd.	—
115	Yorkshire Tar Distillers Ltd.	—
106	Zeal, G. H., Ltd.	—

GLASSBLOWING

IMPOSSIBLE! .....
FANTASTIC! .....
OR SIMPLE .....

We welcome your enquiries

Micro and Semi Micro apparatus available from stock

T. W. McCARTHY & SONS, LTD

COMPLETE LABORATORY FURNISHERS

30a Clifton Street, Cardiff Telephone: Cardiff 26251

JAMES D. BIRCHALL

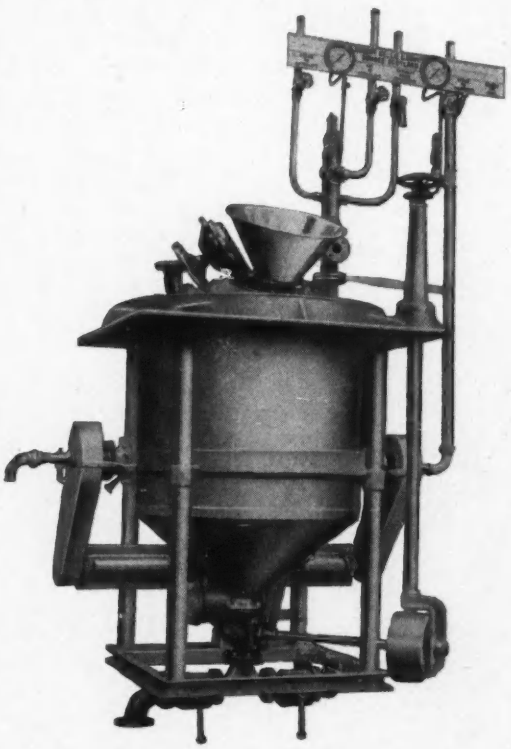
The Classification of Fire Hazards and Extinction Methods

Second printing 8s. 3d. (post paid)

Ernest Benn · Fleet Street · London

Kellie

All purpose Autoclave



FOR PROCESSING WITH STEAM AND COMPRESSED AIR OR STEAM AND VACUUM ARRANGEMENTS

No steam jacket is employed, and there is no local overheating.

Processing is by patent steam heated Revolving Calandria, which incorporates a Swash Plate Impeller.

The rotating movement of the Calandria continually cleans the heating elements.

The ratio of the rotating heating surface to volume is 50 per cent greater than that of a steam jacketed autoclave.

Here is an Autoclave which is designed to supersede the steam jacketed vessels of all types from the viewpoint of economy and efficiency.

For Special Purpose and Processing Plant . . . *Consult*

KELLIE

Write today for further particulars to:

ROBERT KELLIE & SON LIMITED DUNDEE SCOTLAND

Telephone: Dundee 2819 (2 lines) *Telegraphic and Cable address: "Kellie" Dundee · Code A.B.C. (5th Edn).*

ANGLO-DAL LIMITED

NEW OXFORD HOUSE, BLOOMSBURY WAY, LONDON, W.C.1

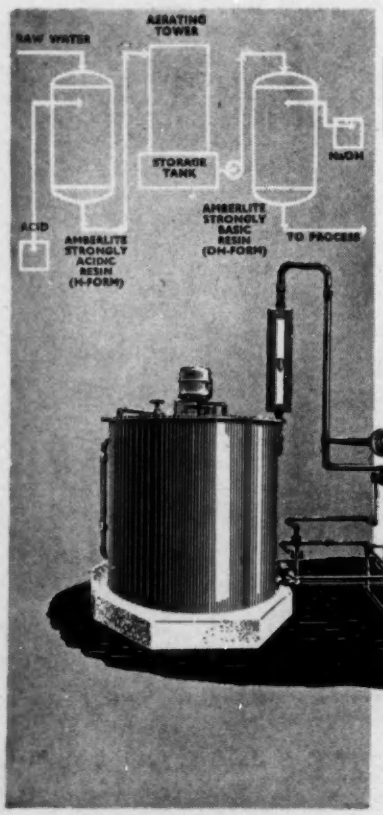
TELEPHONE: HOLBORN 4366 (10 LINES)

SOLE REPRESENTATIVES IN THE U.K. FOR

C I E C H

W A R S A W

For Inorganic Chemicals, Organic Chemicals, Pharmaceuticals, Dyestuffs, Carbon Products, Petroleum and Coal Chemicals, Essential Oils, and Miscellaneous Products



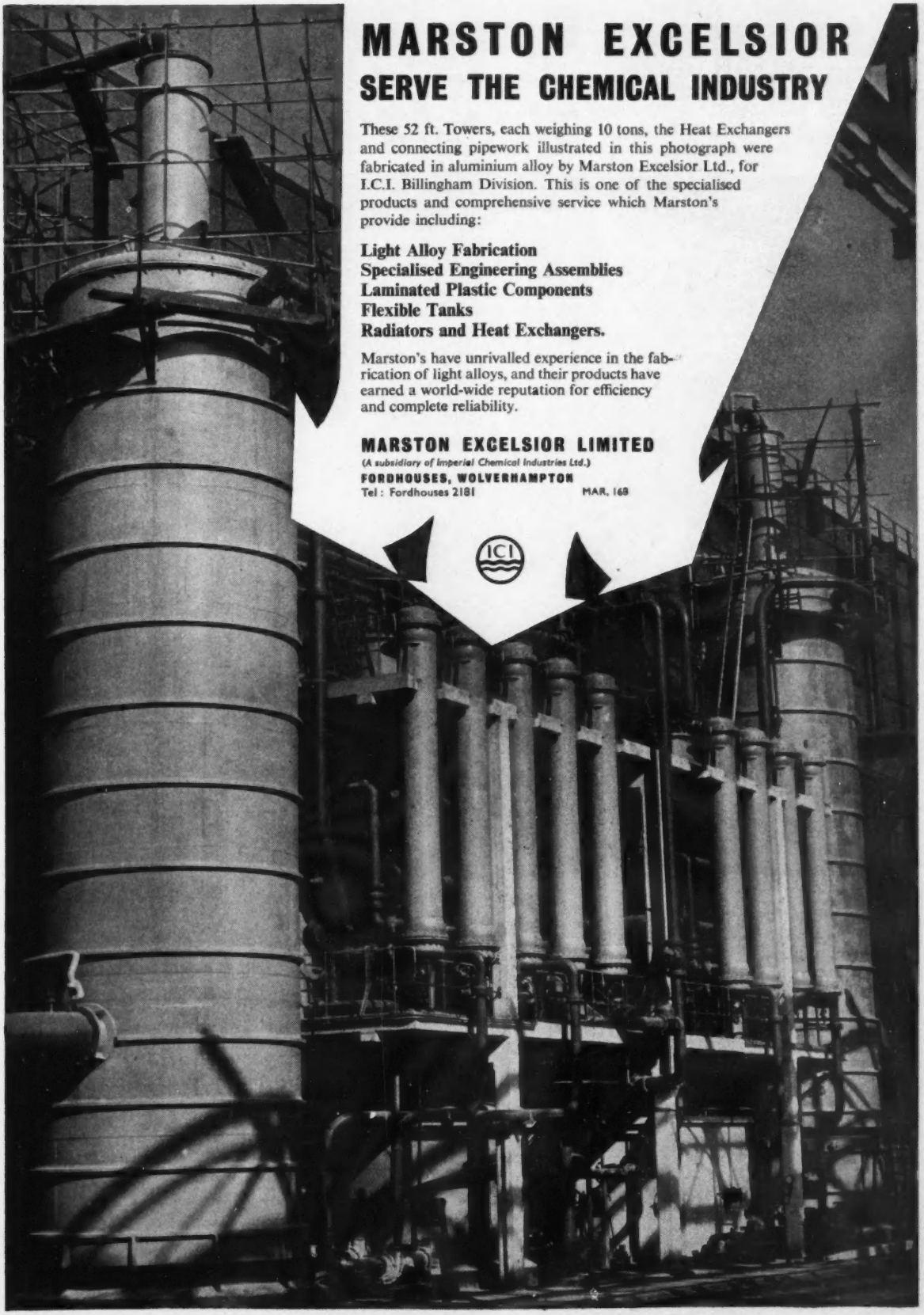
ION EXCHANGE

Ion exchange is the answer to all requirements for water of distilled quality.

Typical plants employing various methods . . . . fully described in our literature available on request.

NECKAR WATER SOFTENER CO. LTD.
Artillery House · Artillery Row
London, S.W.1.

NECKAR



MARSTON EXCELSIOR
SERVE THE CHEMICAL INDUSTRY

These 52 ft. Towers, each weighing 10 tons, the Heat Exchangers and connecting pipework illustrated in this photograph were fabricated in aluminium alloy by Marston Excelsior Ltd., for I.C.I. Billingham Division. This is one of the specialised products and comprehensive service which Marston's provide including:

Light Alloy Fabrication
Specialised Engineering Assemblies
Laminated Plastic Components
Flexible Tanks
Radiators and Heat Exchangers.

Marston's have unrivalled experience in the fabrication of light alloys, and their products have earned a world-wide reputation for efficiency and complete reliability.

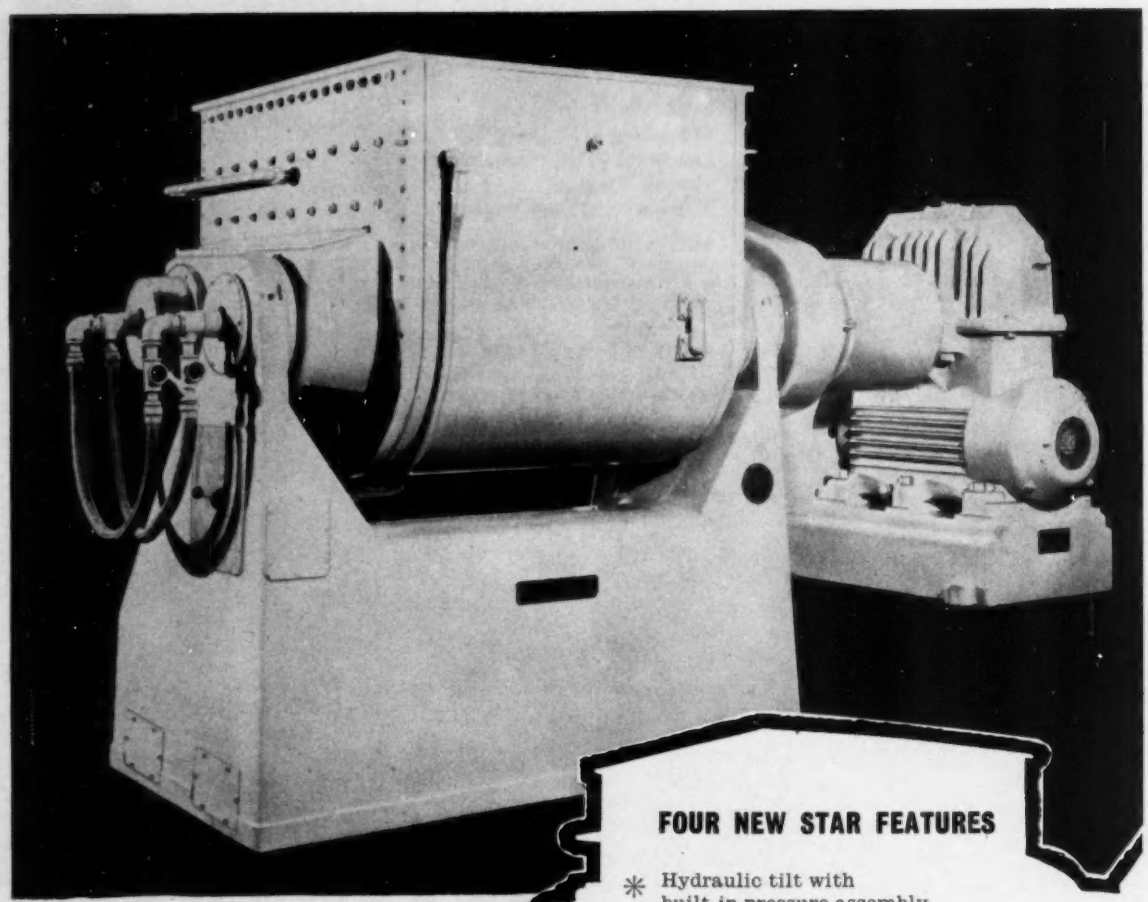
MARSTON EXCELSIOR LIMITED
(A subsidiary of Imperial Chemical Industries Ltd.)
FORDHOUSES, WOLVERHAMPTON
Tel: Fordhouses 2181 MAR. 168

ICI

A 250 GALLON CAPACITY

UNIVERSAL MIXER

TO A *New* DESIGN



FOUR NEW STAR FEATURES

- ✳ Hydraulic tilt with built-in pressure assembly
- ✳ Improved gland accessibility
- ✳ Anti-friction bearings throughout
- ✳ Built-in controls

Plus functional modern styling

One of a range of machines produced in many standard sizes from 2 pints to 250 gallons. There are several basic designs available, including mixers with bottom discharge, and machines are made for a variety of power input ratings. For details, advice and assistance on all aspects of industrial mixing, write to:

Baker Perkins Ltd. ENGINEERS

Westwood Works . Peterborough

BP/CM3

See this wet, see this dry

A large part of any lab's equipment consists simply of containers. Does one ask much of them? Mainly that they should be of the right size and be sensibly, stoutly built: two notable characteristics of PYREX. For PYREX production methods are large-scale, the range of items and sizes enormous. And PYREX are masters of designing and making really strong glass equipment. Small wonder that so many people with scientific work to do demand PYREX

Pyrex desiccators

— Now available at new reduced prices —

are made from the same borosilicate glass as other PYREX laboratory and scientific glassware. They therefore

withstand thermal shock
resist chemical attack
have exceptional mechanical strength

Rugged construction Remarkable mechanical strength, as a safeguard against implosion in vacuum work

First-class vacuum retention A special high vacuum model is also available

Specially designed to give maximum available working space and ease of cleaning

Pyrex reagent bottles and aspirators

Extremely wide range of sizes—from 5 ml. to 20,000 ml. —available promptly from stock

Many different patterns: with or without stopper; narrow neck or wide neck; tubulated, or fitted with ground-in stopcock with interchangeable socket

Great mechanical strength thereby considerably reducing replacement costs

● **Ask for a catalogue from**

PYREX

Regd. Trade Mark BRAND

MADE IN JP PYREX JP ENGLAND

Laboratory and scientific glass

INDUSTRIAL SALES DIVISION JAMES A JOBLING & CO LTD Wear Glass Works Sunderland

AMBERLITE
ION EXCHANGE RESINS

Chemicals for Industry

What can AMBERLITE Resins Do For Industry?

Here are a few of the successful applications of AMBERLITE ion exchange resins:

Antibiotics are among the pharmaceutical products manufactured with the aid of AMBERLITE resins.

Uranium for atomic energy usage, is extracted by means of AMBERLITE ion exchange resins in many parts of the world. Special types of AMBERLITE resins are used in reactor coolant circuits.

Sugar and glycerol solutions are purified in columns containing AMBERLITE resins.

Metal recovery from plating wastes is being successfully accomplished by using AMBERLITE resins.

Water conditioning by means of AMBERLITE resins provides softened, dealkalized or deionized water for many industrial uses. Water of triple distilled quality is produced by the AMBERLITE Monobed System.

For further information and suggestions, write for a copy of the booklet "Ion Exchange with the Amberlite Resins".

CHARLES LENNIG & CO. (GREAT BRITAIN) LTD.
26-28 BEDFORD ROW
LONDON, W.C.1

Amberlite is a registered trade mark of our parent company Rohm & Haas Co., Philadelphia

VOL. 81 No. 2068
FEBRUARY 28 1959

Telephone: FLEet Street 3212 (26 lines)
Telegrams: Allangas - Fleet - London

Editor M. C. HYDE
Manager H. A. WILLMOTT
Director N. B. LIVINGSTONE WALLACE

Midland Office
Daimler House, Paradise Street, Birmingham. [Midland 0784-5]

Leeds Office
Permanent House, The Headrow, Leeds 1. [Leeds 22601]

Scottish Office
116 Hope Street, Glasgow C2. [Central 3954-5]

IN THIS ISSUE

Waste Gas Adsorption	350
First Liquid Gas Shipment	351
U.K.'s First Beryllium Plant	351
Distillates	352
New Plant for Food Dyes	353
Chemical Engineers' Conversazione	354
Radiation Chemistry Symposium	355
Monsanto's Foamable Polystyrene	357
New Synthetic Resin Emulsions	358
Absorption of Ammonia Study	359
Air Pollution in Germany	360
Overseas News	361
People in the News	363
In Parliament	364
Trade Notes	365
Chemical Prices	366
Commercial News	368
Market Reports	368
New Patents	370

Annual subscription is: home, 52s 6d, overseas, 60s, single copies 1s 6d (by post 1s 9d)

C

CHEMICAL AGE

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

COLONIAL RESEARCH

RESEARCH has become an integral part of the U.K.'s long established Colonial policy of promoting self-government in the dependencies. Such research involves a wide range of problems as is noted in a Central Office of Information study of the subject (R.P.4035). Thus many of the dependencies lie in the tropics and the advancement of the peoples in such areas has been retarded by conditions, customs and traditions, etc. Better living standards requires among other things the defeat of the mosquito, tsetse fly and the locust, the elimination of plant diseases, the breeding of new crops and animals, the irrigation of land, the provision of pure water for men and animals, the discovery and exploitation of minerals, and sources of power.

It was towards the last years of the nineteenth century that interest in the U.K. in systematic colonial research was stimulated. During the following 40 years various committees on colonial research were set up and some small-scale research projects financed. Most of the research activities, both of colonial governments and of U.K. research organisations, were directed to problems of health such as the cause of malaria, the incidence of trypanosomiasis, yellow fever, yaws, filiaris and tuberculosis, and in the field of agriculture to plant pathology and crop breeding.

In the last 20 years, a considerable change has taken place in the official approach to colonial research. Activities had been restricted by the finances available and by a shortage of scientific workers. The latter, in particular, tended to suffer from isolation from fellow workers in their own or kindred fields of science; there was, for instance, no organised means of linking up their activities with those of scientific institutions in the U.K., and for this reason distinguished scientists were reluctant to take up permanent duties overseas. Finally, there was no central organisation of colonial research and hence no method of pooling resources of manpower and equipment and no co-ordination between different fields of research which is necessary if investigations into specific problems are to be comprehensive and to have satisfactory results.

The passing of the Colonial Development and Welfare Act 1940 began a new phase in colonial research and after the war the revised Acts of 1945 and of 1950 increased the annual maximum disbursement ceiling to £2.5 million. By March 1958, the sum committed to be spent on colonial development and research amounted to some £17.2 million. About 35% of the gross allocation of £17.2 million allotted to U.K. Colonial Development and Welfare research schemes since 1940 has been for agriculture, animal health and forestry research. This includes 16% for medical research; 9% for tsetse and trypanosomiasis; 8% for insecticides research; 5% for research sponsored by the Colonial Products Council; and 6% for miscellaneous schemes. East Africa has received 38% of the gross allocation, the West African group 17%, South East Asia territories and Hong Kong 8%, West Indian colonies 12%, Central African territories (Northern Rhodesia and Nyasaland) 5% and for other territories and schemes of general interest, 20%. A full account of progress in the various fields of research was published in the Annual Reports on Colonial Research 1943-47. It is to be hoped,

however, that more frequent reports will be published in future.

Research projects are now organised in a number of different ways and can be classified as follows: schemes organised on a regional basis; schemes organised and directed by the heads of individual research stations and laboratories and research units in dependent territories; research undertaken by various bodies; officially sponsored research organised in collaboration with particular industries, as for instance the West Indies sugar research scheme; research sponsored by academic or non-official research institutes in dependent territories; schemes organised as part of the research activities of the technical departments of colonial governments; investigations carried out in the dependencies under the direction of official U.K. research bodies, such as the Department of Scientific and Industrial Research; schemes organised under the aegis of specialist advisory committees; special investigations carried out in the U.K. either by arrangement with research institutes or in specialist establishments of the Department of Scientific and Industrial Research.

The shortage of scientific personnel has to some extent been overcome by the creation of colonial research fellowships (25 in number) and awarding a series of research studentships in various fields. The Colonial Research Service, reorganised in 1954, has further improved the position of research workers. The conduct of colonial research is also assisted by advice and assistance from research institutes serving the Commonwealth countries, e.g. the Commonwealth institutes and bureaux.

Today, researches in agriculture, animal health and forestry are still among the most important branches of colonial research, since it is upon the effective use of land that the welfare and prosperity of the peoples of the dependent territories depend. The use of fertilisers in particular, has led to economic returns in most areas. In recent years, methods of weed eradication have been studied, for in tropical countries the rapid growth of weeds makes them a specially serious menace to crop production. Thus the use of organic weedkillers figures prominently in research programmes and a large series of herbicides are under test in many countries. Disease and pest control through chemical means has also made notable advances. As a result of experimental work with newly developed chemicals considerable advances have been made in the control of pests and diseases of cotton.

Research in pesticides began as a separate field of research in 1947. Many of the problems connected with insect control are fundamental in character and are found to be the best studied in U.K. laboratories. The colonial pesticides team at Porton, near Salisbury, and research workers attached to the field station of the Imperial College of Science and Technology, Silwood Park, and to the Rothamsted Experimental Station undertake basic research on insecticides. Field, laboratory and greenhouse studies, etc., are undertaken under the direction of the Agricultural Research Council and at the Long Ashton Research Station. The main centre of overseas colonial pesticides research activity is at Arusha in East Africa. At the same time, in most of the dependent territories, a considerable volume of pesticides research is being carried out independent of the Colonial Pesticides Research Committee.

Research into colonial products has been carried out ever since the first traders established themselves, but in 1943 the scope of research was widened. Products research now includes investigations undertaken at the Tropical Products Institute (see CHEMICAL AGE, last week, p. 324) Research outside the laboratory includes investigations into the fundamental physico-chemical aspects of sugar clarification at the Sugar Technological Laboratory, Trinidad, research on the chemistry of local plants and the methane fermentation of vegetable waste in the Department of Chemistry and Agricultural Engineering at Makerere College, Uganda, and studies carried on in the research departments of a number of U.K. universities.

These are only a few of the research projects of colonial research today. The conception of colonial research as a co-ordinated operation, studied and planned over the whole field and not territory by territory has led to the removal of many of the drawbacks associated with early colonial research and has led to the rapid progress that has been, and is being, made.

WASTE GAS ADSORPTION

ADSORPTION of gases and vapours on adsorbents, such as ion-exchange resins has been used hitherto almost exclusively for scientific purposes, especially for studying the various kinds of sorption. In the case of zeolites a particular prerequisite for gas adsorption has been preliminary dehydration and evacuation. A British Patent (No. 805,853) recently granted to the East German enterprise Veb Farbenfabrik Wolfen suggests that ion-exchange resins can be economically used for gas adsorption or purification on an industrial scale.

The patent claims that ion exchange resins exhibit a very much increased loading capacity with respect to the gas phase if they are used in a distinctly moist condition, i.e. having a moisture content within the range of 50-70% by weight. Furthermore the much greater quantities of acidic or basic compounds thus taken up can be removed from the filter bed by simple washing with water and after being so regenerated the resin can be used immediately in the next charging operation. It seems that with this method of working the acidic or basic gas constituent is loosely bound to the resin (i.e. by physical force); only occasionally is it necessary to carry out a complete regeneration of the resin in order to remove the relatively small quantities of adsorbate chemically held on the exchanger. The industrial advantage of working with moist ion-exchange resins for adsorption of gases and vapours is the speed and completeness of the adsorption obtained.

It is stated that by lightly irrigating the layer of ion exchange resin with water during removal of acidic or basic constituents from a gas, the period of use of the layer can be prolonged to such an extent that the operation becomes practically continuous. By repeatedly using the washing water for humidifying the current of gas or regenerating the resin it is possible to concentrate and so recover the adsorbate.

Examples cited include removal of ammonia from air, concentration of dilute hydrochloric acid vapour and, particularly interesting from the clean air aspect, purifying stack gas from a contact sulphuric acid plant. In the latter case, the gas containing an average 4 gm. SO_2 per cubic metre was passed at very high speed through a filter charged with a strongly basic anion-exchange resin with a moisture content of 67% by weight. During a period of 7½ hours 3,000 parts by volume of the waste gas were passed through 1 part by volume of the resin and the column of resin was then washed during the course of ½ hour with 5 parts by volume of water. This sequence of charging and washing was repeated 18 times after which the column was subjected to complete regeneration with 5 parts by volume of 4% caustic soda solution and washed neutral with 50 parts by volume of softened water. This cycle of operations was repeated with complete regeneration again effected.

HOW METHANE PIONEER BROUGHT FIRST LIQUID GAS SHIPMENT TO U.K.

MARKING the completion of the first stage in an experiment which has attracted world-wide attention was the arrival on 20 February of the *Methane Pioneer* at Canvey Island, Essex, with the first load of liquid natural gas ever to be carried by sea. The voyage of this specially converted vessel has shown that it is technically possible for methane to be transported over thousands of miles of ocean in liquid form at a temperature of −260°F.

Methane Pioneer which is owned by British Methane Ltd., jointly formed by the Gas Council of Great Britain and Constock International Methane Ltd., left the Gulf of Mexico on 31 January. The experimental load consisted of 2,000 tons of liquid methane. Constock liquefied the gas in a methane liquefaction plant mounted on a barge on the Calcasieu River, near Lake Charles, La. This plant can produce 1,500 barrels per day of liquid methane.

This liquefaction plant is reported to operate in the same way as those used to make liquid oxygen. Methane is compressed, cooled and expanded through a turbine in repeated steps to condense it at −258°F. The gas expansion turbine takes energy from the expanding gas, supplies it to gas compression thus raising overall efficiency.

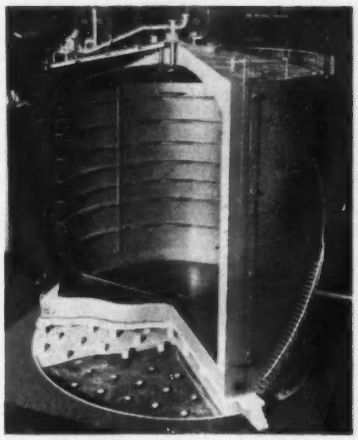
Vaporised Gas

After liquefaction, when volume of the methane was reduced to 1/600th of the space occupied in gaseous form, the liquefied gas was loaded into five special tanks in the *Methane Pioneer*. These tanks are aluminium with a 12 in. insulation of balsa wood and an outer jacket of steel. Methane forms small bubbles in balsa wood minimising penetration and heat transfer. The aluminium, it is reported, will withstand the cold should a leak develop in the insulation.

On the *Methane Pioneer*, Constock engineers estimate that about 0.5% of the cargo would vaporise each day of the voyage. Arrangements were made for the vaporised gas to escape through vents in the ship's deck. Being lighter than air, the methane would disperse without creating a hazard at deck level. Later ships, it is suggested, will be designed either to re-liquefy the vaporised methane and return it to tanks in the holds, or the gas will be used as fuel.

Safety features added to the *Methane Pioneer* have been a system to detect and counteract (method not disclosed) any escaping gas that might collect and protection of the ship's hull should a cargo tank rupture.

Liquefied methane will be pumped by specially designed ship's pumps from the *Methane Pioneer* and through a pipeline



This model is of an insulated storage tank built by Whessoe to hold 1,000 tons of liquid methane at a temperature of −260°F. The inner aluminium alloy tank in which the liquid methane is stored is 50 ft. in diameter and 46 ft. high. The outer tank of mild steel is 56 ft. diameter and 56 ft. high

with a 6-in. covering of insulation from the jetty to two storage tanks, each of about 1,000 tons capacity. One has been built for the North Thames Gas Board by the Whessoe Co. Ltd., Darlington; the other by the A.P.V. Co. Ltd., Crawley. Although these storage tanks are heavily insulated, there will be a continuous boil-off of gaseous methane from the liquid and this material will be contained in a small gasholder of the dry-sealed Wiggins type, whence it will be pumped into the mains system of the Romford Works of the North Thames Gas Board (N.T.G.B.) for reforming.

Liquid methane will be vaporised by heat exchange with water or steam. At this stage use will not be made of the cold content or of the refrigerating capacity of methane. The liquid methane will be converted to gas under pressure, and the pressure will be used to convey the gaseous methane into the N.T.G.B's transmission lines. A new line has been laid from Canvey Island to connect with a high pressure main already in existence between Shellhaven and Romford Works, and the gaseous methane will mix with refinery gases from the Shellhaven refinery.

North Thames distribute town's gas at 500 B.Th.U. per cu. ft. Methane has a calorific value of 1,000 B.Th.U. per cu. ft., and reforming of the methane into gas of 500 B.Th.U. per cu. ft. will be carried out at Romford by the Onia-Gegi catalytic process.

Natural gas in its original form is estimated to have an equivalent of approximately 530 therms per ton. Allowing for losses during the conversion processes and during the voyage, the Gas Council estimate that the net value to the gas industry will be approximately 480 therms per ton. The equivalent capacity of the trial shipment of 2,000 tons will therefore be a little short of one million therms (N.T.G.B. produces over 400 million therms a year).

If the trials prove successful, consideration will be given to the import of liquid methane on a much larger scale. The Gas Council point out that vessels carrying some 30,000 tons would probably be required in order to secure real economy.

New Iscor Plant to make Beryllium metal

PLANS for a plant at Avonmouth for commercial production of nuclear grade beryllium metal are announced by Imperial Smelting Corporation, the U.K. operating subsidiary of Consolidated Zinc Corporation.

The plant is expected to be in operation at the end of this year, and will be the first commercial production unit for virgin beryllium in the U.K.

Last September, I.C.I. announced plans to build the first European plant for producing wrought beryllium (CHEMICAL AGE, 6 September 1958, p. 398).

Imperial Smelting Corporation have been under contract for a number of years to the U.K. Atomic Energy Authority, investigating a thermal reduction method. They state that this work has been successfully concluded and beryllium metal of the highest purity has been produced.

The Atomic Energy Authority, using beryllium for experimental gas-cooled reactors, is the largest user in the U.K.

Steering Committee for Safety Equipment Makers

A MEETING at the headquarters of the National Union of Manufacturers on 17 February appointed a steering committee to decide on details of a constitution for a proposed association of manufacturers of personal equipment for industrial safety.

Manufacturers can obtain information from the National Union of Manufacturers, 6 Holborn Viaduct, London E.C.1, or Mr. E. Roy Mullins, Parmelee (G.B.) Ltd., Bedford Avenue, Trading Estate, Slough, Bucks.

Course on Micro- and Semi-Microchemical Methods

Commencing 18 April 1959, a course of 12 lectures on 'An introduction to micro- and semi-microchemical methods' and appropriate practical work will be held on Saturday mornings at the Norwood Technical College, London, S.E.27. This course is particularly suitable for teachers and industrial and research chemists.

I AM delighted to see from the preliminary figures that British chemical exports in January showed a healthy recovery. Valued at £23,529,000 they were above the monthly averages for the last quarter of 1958 (£22,400,000), for the first nine months of the year (£21,593,000) and for 1957 (£22,157,000). This, of course, represents only one-month's figures, but after the slight decline last year, it is a good start to 1959 and augurs well for the rest of the year.

It is also notable that imports of chemicals in January, at £9,868,000, were below the monthly average of £10,868,000 for the last quarter of 1958.

THERE are signs in the U.S. that titanium, although still in surplus supply, is selling more freely than in the past year. One large producer, National Distillers and Chemical, who with P. R. Mallory and Sharon Steel own Mallory-Sharon Metals, producers of primary titanium sponge, expect titanium sales to reach $18 million this year compared with £13 million in 1958.

Another joint company—Titanium Metals, a subsidiary of Allegheny Ludlum Steel and National Lead—has reported a 20% rise above 1958 average levels in shipments of titanium products to industry in 19 December. This increase in sales probably reflects the drop in price for titanium rods from $5.50 per lb. early in 1958 to $3.50.

While at this price titanium still compares unfavourably on a price-to-weight basis, with other metals, it can offer, particularly in the chemical plant field, advantages that make it more of an economic proposition than at first appears. There are, for instance, many sections in the chemical industry where the use of titanium brings a considerable reduction in maintenance and replacement charges, compared with other materials.

SINCE CHEMICAL AGE referred to the Premier dispersion mills in our preview of the Chemical and Petroleum Equipment Exhibition at Olympia (14 June, p. 1111) sales have exceeded all expectations. In fact Mr. L. P. China, director of Premier Colloid Mills tells me that they have sold 250% more of the 3-in. Mk. 11 bench models than anticipated.

I am glad to hear that extensive reporting of these units in the technical press between June and October gets the credit for helping develop widespread interest in them.

Further testimony to the value of the technical press comes from an article by Mr. N. G. H. Thomas on 'Commercial chemical development' in the *R.I.C. Journal* (February, p. 75). Writing on the launching of a new chemical, he describes the point at which "it is valuable to invite the co-operation of the trade press in the fields in which one is interested to give some publicity to the new product, its properties and uses. This frequently brings one into contact with some unexpected and hitherto unsuspected support. . . . The trade press performs a valuable service here in catalysing developments between companies."

The value of the technical journals in disseminating information on new products is just beginning to be appreciated in the chemical industry. Too many companies still spend too much time trying to prevent publication of technical data in the press even when they are fairly widely known. They fail to appreciate the prestige and goodwill value attaching to their company when their new developments are described in reputable journals.

SMOKELESS fuels are much in the news these days and I am glad to ascribe credit where it is due for one development which has made possible a radically new approach to the problem of making these fuels. The new processes which use small coal and coal dust with a high volatile content to make smokeless fuels are based on one central discovery made at the Central Research Establishment of the National Coal Board.

It was discovered that coal can be made smokeless by a mild heat treatment which reduces its volatile content only to a figure in the range between 23% and 33%. Scientifically this development rests on the finding that the smokiness of a fuel depends on its tar content and that the mild heat treatment of high volatile coals drives off the tar without driving off the freely burning gases.

Speaking at a recent meeting of the Parliamentary and Scientific Committee, Dr. J. Bronowski, director of the establishment, said that the staff was now also studying the compacting of small coal and coal dust so as to make a usable fuel (generally an industrial fuel) without further treatment.

DEVELOPMENT of a light-sensitive, re-usable photographic material from which the latent image can be erased is one of a number of unsolved problems in chemistry facing U.S. military scientists, according to the 1958 supplement to 'Inventions Wanted by the Armed Forces', which can be obtained free from the National Inventors Council, Department of Commerce, Washington 25, D.C., U.S.

A material for waterproofing gauges that will bond to any material and which must remain flexible in the temperature range −20 to 140°F is another unsolved problem in the chemistry category. Also included is a new method of making coloured smokes. In present smoke mixtures, 80 to 90% of the dye is lost by decomposition.

An adhesive for heatless application in temperatures as low as 40°F, which can hold a 2½ lb. block of bare or packaged explosive on a vertical square for 60 days, is yet another. The final problem which I quote is a metal-to-metal bond for aeronautical structural applications required for temperatures up to 600°F and which should have a shear strength of at least 2,500 p.s.i.

OPPORTUNITIES for apprentices, foremen, works managers and executives to visit major undertakings in the chemical and allied industries on the Continent are to be provided by Industrial Travel, a specialist division of Y.T.C. Universal, a non-profit travel organisation of Liverpool. The scheme is under the direction of Mr. Leon E. Child, who has established contact with more than 100 firms in five European countries.

The visits may last eight, 10, 12 or 14 days and may include complete industrial tours combining holiday activities in one or more countries or visits to specific factories or specific countries. Not one of the European firms approached—and each one is a leader in its own particular field—had refused to co-operate.

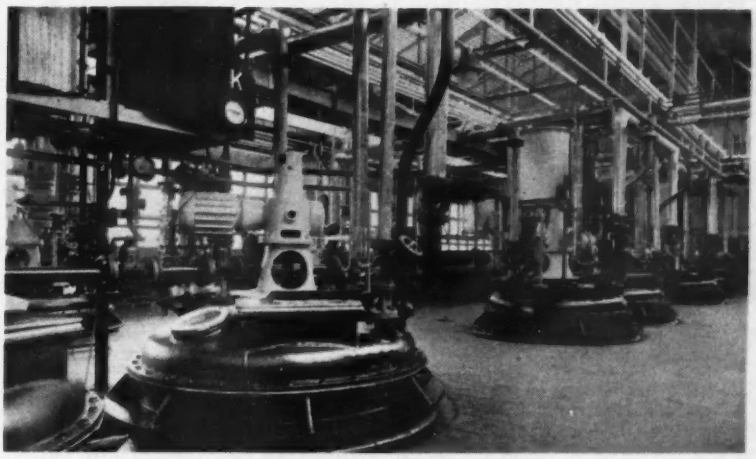
Minimum numbers required to make up parties are eight for executives or management level and 20 or more for apprentices. Mr. Child tells me that the industrial tours can be arranged to suit individual requirements. Firms, groups of firms, institutes or associations making inquiries will be provided with three itineries from which to make a selection.

ACCORDING to Pekin Radio reports, Chinese botanists have found that sunflower stalks may be used as raw material for synthetic fibres and certain synthetic proteins. Only a simple production process is necessary, it is stated. While giving no further details on the subject of synthetic fibres, Pekin says that a series of reactive dyes, now being exported from China by the Tientsin in commercial quantities, are based on the proteins yielded by the sunflower treatment process. These dyes, with the trade name Utopid, are in a range of 12 colours, excluding black. They are mixed at a Tientsin plant to a thick paste with alcohol, sodium lye and hot water, then cooled and thinned down by the addition of cold water. In this form —a thin paste—they may be applied directly on material.

Alembic

NEW PLANT FOR FOODSTUFFS COLOURS

Designed and Installed by Staff of Williams (Hounslow)



Intermediates treatment plant

TO MEET the exacting needs of the foodstuff industry throughout the world with regard to foodstuff colour manufacture, Williams (Hounslow) Ltd., are now operating a totally-enclosed plant—designed and installed by the company's own staff. In particular, the plant incorporates many new and interesting features, such as the extensive use of mechanical aids in the control and flow of raw materials and intermediate products.

In designing the plant, Williams (Hounslow) Ltd., have borne in mind the importance of avoiding contamination of the colouring materials (contamination being considered in parts per million). Manhandling of materials has, therefore, been reduced to a minimum, and as far as possible all plant is enclosed. Modern materials of construction such as plastics materials (p.v.c., polythene, polyester resin, etc.), have been used throughout. In particular, rubber for lining and covering of vessels, filters, etc., has been employed, and where practicable, p.v.c., polythene and polyester resin for pipes and ducts.

Corrosion-resistant Linings

Vessels in which the dyestuff intermediates and actual dyestuffs are produced are lined and encased with rubber, or plastics material, such as polythene to prevent corrosion and contamination of the product. Similarly the pumps employed have essential parts of stainless steel.

Much of the plant represents in itself improvements in general engineering practice and was, of course, specially designed and constructed for the function it plays. Raw materials, stored in bulk at ground level, are elevated to the top of the building by pump or lift. Water required for processing is of the highest purity. An adapted plant softens water and there is a demineraliser.

An ice plant discharges to the top working floor, where the first operations of colour manufacture start. Subsequent processes are carried out on lower floors. Materials are moved largely by gravity through the intermediate processes, the dye forming stage, the clarification section, the colour isolation, right down to the ground floor where the dyestuff is dried to a powder in unique stainless steel containers and where the finished product—the pure foodstuff colour of the highest quality—is transported to the packing department in sealed trucks.

The intermediates treatment plant contains six vessels sunk into the floor which are fitted with materials inlet pipes. Another series of vessels forms the colour isolation plant where the various salts of dyes are produced.

In the clarification plant multileaf pressure filters are used. Colouring matter is obtained in cake form, using vertical filter presses. These are used in preference to tray-drying methods in the interests of cleanliness.

From the colour presses the colouring matter in powder form containing 40% water is passed to the enclosed drying plant. The drying equipment has been specially designed by the company in the light of their many years of experience in colour manufacture.

Packing and Despatch

After being thoroughly dried, the colours are transferred after passing quality control and the stringent specifications imposed, to large storage vessels, from which the colours are packed as required in polythene bags in metal drums for despatch to customers in 60 countries.

The whole chemical system is controlled from a built-in laboratory which also maintains a rigid watch on quality. Notwithstanding this, the final checking of the finished product is carried out quite independently in the company's separate control laboratories.

Because of the high degree of automation throughout the plant a comparatively small labour force for the productive capacity of the plant is employed. Three shifts man the plant 24 hours a day.

Since 1877, Williams (Hounslow) Ltd., have been engaged in the manufacture of specialised synthetic organic dyestuffs and fine colours. A major portion of the company's manufacturing activities is devoted to the production of colours for the printing ink, plastics, oil and wax, leather, varnish, lacquer and petroleum industries. Some 30 basic colours are produced from which it is possible to obtain almost any shade. The company has been actively connected with the food processing industry since the inception of the use of coal tar colours in foodstuffs.

Birmingham Symposium on Fluorine Chemistry

AN international symposium on fluorine chemistry will be held at Birmingham University from 15-17 July. It will be sponsored jointly by the university and the Chemical Society.

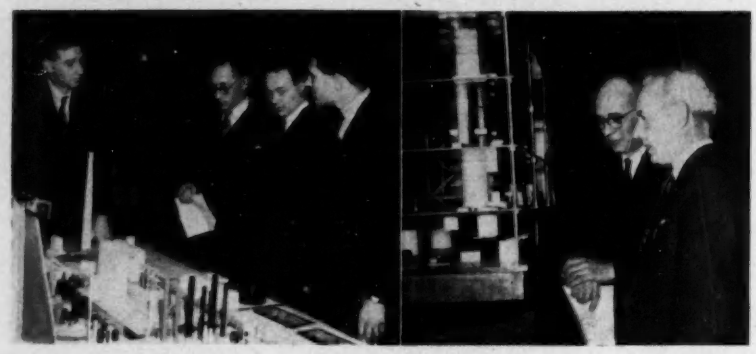
The president is Professor M. Stacey, chairman Dr. J. C. Tatlow, secretary Dr. D. H. Whiffen, and committee Dr. J. Burdon, Dr. R. D. Peacock, Dr. C. R. Patrick and Dr. R. Stephens.

U.S. and German, as well as British, chemists will be among the lecturers. Accommodation will be provided in the university halls of residence. Application forms will be sent out early in April.

Combustion Methods in Organic Microanalysis

A series of special lectures on Friday evenings (6, 13 and 20 March) at 6 p.m. will be held at Norwood Technical College, with practical work on Saturday mornings. It is hoped to include in the practical work the determination of C and H by the Pregl and Ingram methods; N by Dumas and Kjeldehl; I by dry combustion and the Schoniger method; and S by the Schoniger method. London fee for the course is 10s.; applications for admission should be made to the secretary of the college at Knight's Hill, London S.E.27.

CHEMICAL PLANT MODELS AS THEME OF CONVERSAZIONE



L. to r. at the display of Humphreys and Glasgow: C. T. Hawkes (Humglas), R. F. Twist (South Eastern Gas Board) and T. R. Twist and G. L. Fryer (Humglas). Right, Ernest Holmes (managing director of Industrial Models Ltd.), right, shows a preliminary layout kit depicting chemical plant to J. B. McKean (chemical engineer, South Eastern Gas Board)

CONVERSAZIONE of the Chemical Engineering Group, Society of Chemical Industry, was held at Battersea College of Technology, Battersea Park Road, London, on Friday, 20 February. It was attended by 120 members and guests, less than was expected because 170 tickets had been sold; it is thought that 'flu accounted for the missing 50.

Those present saw a number of exhibits and a film show and were able to inspect the work in hand by students in the Chemical Engineering Department of the College. Exhibits in the Great Hall illustrated the theme 'The use of models in chemical plant design.'

They were provided by Alfa-Laval Co. Ltd., Dorr-Oliver Co. Ltd., W. J. Fraser and Co. Ltd., who featured a model of a desulphurising plant, Humphreys and Glasgow Ltd., with a model of a Lurgi gasification plant, I.C.I. Plastics Division who showed the photometography system, Industrial Models Ltd., who had a number of models on show, including one of the first nylon plant at Wilton and one of a Wiggins dry seal gasholder, Kellogg International Corporation who exhibited a crude oil distillation unit in model form, Premier Colloid Mills Ltd. and the U.K. Atomic Energy Authority.

The film programme included the following: 'Atoms at Work,' taken at Harwell; 'Colour,' development of dyestuffs and their current large-scale manufacture; 'Making Cartons for Soda Crystals'; 'Treasure Trove,' showing how rocks are won by quarrymen and miners and changed by chemists into a multitude of things to enrich the lives of everyone; 'The Glass-blower'; and 'New Detergents.'

Top left: F. Dunkin (W. J. Fraser and Co.), right, shows a model of a desulphurising plant to Alec Webster (Ministry of Supply) and Mrs. Webster. Top right: studying a Kellogg model of a distillation unit are Dr. S. R. Tailby (head of Chemical Engineering Department, Battersea), left, and J. L. Sweeten, hon. secretary, S.C.I. Chemical Engineering Group (senior project engineer of Kellogg International Corporation). Bottom left: l. to. r. at the photometography display of I.C.I. Plastics Division are E. Gysemans (Stone and Webster), W. Lane (Badger Ltd.) and D. Boalch (Stone and Webster). Bottom right: R. S. Colborne, consulting chemist (right), with Engineer Rear Admiral C. R. Bennett (B.T.R. Industries Ltd.)

Chemicals Restricted in Mersey Tunnel

FROM 9 March vehicles carrying dangerous loads will not be allowed to use the Mersey Tunnel during the periods 8.15 a.m. to 10.15 a.m. and 4.15 p.m. to 6.15 p.m. Monday to Friday inclusive and between 8.15 a.m. and 10.15 a.m. on Saturdays.

Dangerous loads include corrosive acids, chemicals and other substances of a dangerous nature, inflammable liquids which give off vapours at temperatures of less than 73 degrees, compressed gases, and empty compressed gas cylinders. The traffic manager has the right to exclude any vehicle carrying a dangerous load at any other time.

New Polyester/Glass Etching Troughs are Acid-resistant

Etching troughs in polyester/glass, replacing teak, have recently been installed at Sun Printers Ltd., Watford, to overcome corrosion problems encountered with older units when etching and cleaning off cylinders. The troughs were moulded by Wemyss Woodhouse Ltd., Watford, using a chemically resistant Cellobond polyester resin of British Resin Products Ltd. and glass fibre. A special modifying agent was added to the resin to give the exceptionally high degree of resistance required for this application. The troughs remain unaffected by such chemicals as iron perchloride, hydrochloric acid, the toluol group of solvents, acetic acid, methylated spirit and caustic soda.

Organotin Fungicides are 'Most Astonishing' Result of Tin Research

The fact that fungicides could now be made from chemical compounds of tin was described recently by Dr. Ernest S. Hedges, director of the International Tin Research Council, as the most astonishing result of all the research he had directed. He believed it pointed the way to a large new consumption of tin in the future. Dr. Hedges was speaking last week on research in tin to a meeting of the International Tin Council.

RADIATION CHEMISTRY SYMPOSIUM

Up-to-Date Picture Presented in Papers at Bradford

TO present an up-to-date picture of radiation chemistry, the Bradford Chemical Society in conjunction with the Department of Chemical Technology, Bradford Institute of Technology and the Yorkshire Council for further Education held a symposium on 'Radiation Chemistry' at the Bradford Institute of Technology on 13 and 14 February.

Papers read at the symposium were as follows: 'Fundamentals of Radiation Chemistry', Dr. E. Collinson, Leeds University; 'Radiation Chemistry of Aqueous Solutions", Dr. J. H. Baxendale, Manchester University; 'Radiation and Polymer Chemistry', Dr. H. Dalton, Wantage Radiation Laboratories; and 'Radiations Effects in Organic Systems', Dr. R. Roberts, also of Wantage Radiation Laboratories.

The chair at the evening session on 13 February was taken by Dr. W. Cule Davis, chairman, Chemistry Advisory Committee, Yorkshire Council for Further Education, who also opened the symposium. The chair during the morning session on 14 February was taken by Dr. E. G. Edwards, principal, Bradford Institute of Technology, and in the afternoon session, by Mr. D. R. Wood, president, Bradford Chemical Society.

Irradiation of Polymers

In his paper on 'Radiation and Polymer Chemistry', Dr. H. Dalton described how vinyl monomers could be polymerised by high energy radiation in a manner analogous to polymerisation induced by ultra-violet light. Radiation initiation could be used over a much greater temperature range and even in the solid state. Ionic polymerisation could also be initiated by radiation.

Irradiation of high polymers led to a marked change in physical properties, due mainly to cross-linking and degradation reactions. In the case of polythene, other reactions leading to increased unsaturation had been studied. Radiation affected the crystallinity of polymers, and tended to produce a more amorphous material. When polymer solutions were irradiated it was necessary to distinguish between the direct effects of radiation and indirect effects caused by energy transfer from the solvent, or attack by radicals produced from the solvent. Some solvents, notably those containing aromatic nuclei, could absorb large quantities of energy and thus exerted "protective action" over solute molecules. Unsaturated polyesters could be cured by radiation and some advantages over the conventionally cured material had been suggested.

Graft copolymers could be synthesised by several methods involving the use of high energy radiation, and a large number of systems had been studied. In general, Dr. Dalton's lecture surveyed the present state of knowledge of the effects of high energy radiations on vinyl monomers and on polymer molecules.

Fundamentals of Radiation Chemistry Discussed by Dr. E. Collinson

RADIATION chemistry, the study of chemical changes induced by ionising radiations (X- and γ-rays, α- and β-particles, protons and other charged particles), was not merely an extended branch of photochemistry since the mechanisms of energy transference to the irradiated medium were quite different in the two fields, stated Dr. Collinson. In all cases of radiation-chemical change the greater part of the energy transferred to the irradiated medium was transferred from particles, and this was true whether or not the primary radiation was of particle or photon type, the first effect of absorption of a photon being to eject a fast electron.

The mechanism of energy loss by charged particles traversing a medium was predominantly one of coulombic interaction between the charged particles and the electrons of the medium, the entities first formed lying along the tracks of such particles. Some 10^{-16} to 10^{-18} seconds after the passage of the particle such a track could be represented by a 'string of beads' model in which the track was the string and the beads the groups of ions and excited molecules which were formed. Some of the 'beads' would be grouped closely together in branches off the primary track; such branches were termed δ-rays or spurs. Other primary products would be slow electrons.

Our knowledge of the types of excited molecules to be expected, and their likely subsequent behaviour, stemmed largely from photochemistry, for excitations by fast charged particles followed the same selection rules as excitations by light, i.e. they were optically allowed. But with slow electrons it was possible to have optically disallowed transitions of, for example, the singlet $\rightarrow$ triplet type. Nothing was yet known of the possible significance of such transitions in radiation chemistry but electron spin resonance studies might prove to be useful in this connection.

Despite the possible objections, the information on the likely ions and their probable behaviours had to be drawn almost entirely from mass-spectrometric studies. Such studies showed that quite unexpected rearrangements commonly occurred and that reactions between ions and molecules were very rapid, with zero activation energies and frequency factors of the order 10^{12} l.mole^{-1} sec.$^{-1}$. Such reactions were likely to play a significant part in the net chemical effect.

The fate of the slow electrons was uncertain and two different proposals had been made. In the first, the Lea-Gray concept, it was supposed that electrons too slow to cause further ionisations or excitations were able to diffuse away from the primary positive ions (to a distance of about 150 Å in the liquid state) and attach themselves to neutral molecules, forming negative ions which then broke down either spontaneously or on reaction with a neutral molecule or a positive ion. In the second, the Samuel-Magee picture, it was suggested that slow electrons were unable to escape from the primary positive ions on to which they were drawn back by coulombic attraction. Excited molecules were thus formed and these broke down to radicals which were probably hot, and molecules.

Differences in Theories Referred to

Whatever the precise reactions involved, said Dr. Collinson, it was certain that by 10^{-11} to 10^{-12} seconds after the passage of the ionising particle, the 'beads' on the string contained stable molecular products and radicals of various types, some of which might be 'hot'. The only difference in the pictures derived from the two above theories was that on the Lea-Gray theory some of the entities might be separated from the others and be more widely dispersed, whereas on the Samuel-Magee theory all the products would be in the same regions and at essentially the same concentrations.

Subsequent events would depend largely on three factors; the state of the system (gas, liquid or solid), the separation of the 'beads' and spurs along the 'string', and the presence or absence of solutes. In the liquid state there would be a tendency for the radicals in the spurs to undergo radical-radical reactions while trapped in solvent cages. Radicals which escaped the cages would have a higher probability of reaction with solvent, products, or solutes if present. If the 'beads' were packed closely together on the string it could be expected that a higher proportion of radicals would react by radical-radical interaction than for a case in which the 'beads' were widely separated. This explained why a factor known as

Linear Energy Transfer (LET) was so significant in radiation chemistry and biology, stated Dr. Collinson. In a given medium the LET, which was the rate of energy deposition along the particle track, was roughly proportional to the square of the charge on the particle and the inverse square of its velocity. Consequently an α-particle would have a considerably higher LET (LET averaged over the whole particle track) than an electron of the same energy, and α-particles could be expected to give different quantitative effects from those of electrons of comparable energy. Such was generally the case.

It was found that chemical and biological effects varied most markedly in the vicinity of 10 to 20 KeV/μ which was the LET for spurs and corresponded to about 1 ion pair every 4 molecules. In the gaseous state differences arising from differences of LET were expected to be much less marked because there was no cage effect.

Since the absorption of energy from an ionising particle was quite non-selective, it followed that in a mixture of two or more substances the material which was present in the greatest amount would absorb the most energy, and might therefore give rise to the greatest number of reactive entities. A second component in low concentration, capable of reacting with these entities to give stable products was more likely to suffer chemical change by this means than by the direct effects of the radiation. This gave rise to what was termed *indirect action;* if the second material was present in sufficiently high concentration to scavenge all the available reactive species its rate of conversion became independent of its concentration. It was also readily appreciated that a third component added to the mixture might protect the second by competing more favourably for reactive species from the first. For such reasons much use had been made of solutions to study the effects of radiation on solvents. If S was a solute which reacted readily with free radicals to give stable products, the yield of solute converted, usually given as G(−S) (the number of molecules of S removed for each 100 eV of energy absorbed in the system), was often large.

Radiation Produces Definite Reactions in Dilute Aqueous Solutions

IN contradistinction to studies with organic solvents it would seem at first sight that X- and -irradiation of pure water had little effect, stated Dr. J. H. Baxendale, Department of Chemistry, the University of Manchester, in his paper on 'Radiation chemistry of aqueous solutions.' In the cases of dilute aqueous solutions of inorganic and organic solutes however, definite reactions occurred. In the former case both oxidation and reduction processes were common whereas with solutions of organic substances oxidation reactions were more common although other reactions, such as polymerisation and degradation also occurred.

These reactions were not brought about by the absorption of the energy directly by the solute but they resulted from the effect of the ionising radiation on the solvent water. The products of this primary process could be deduced from mass spectrographic studies on water vapour, spectroscopic studies and from the products of the above chemical reactions.

All the observations could be accounted for so far in terms of the primary production of H, HO, H_2 and H_2O_2 which subsequently reacted with the solutes. These primary yields (G per 100 e.v. absorbed) had been quantitatively determined, and allowed a consistent quantitative and qualitative interpretation of the reactions occurring in aqueous solution.

Shell Chemical's Endrex 20 for Big Bud Mite Control on Blackcurrant

USE of endrin on blackcurrants for big bud mite control has been agreed by the Ministry of Agriculture. Trials by the National Agricultural Advisory Service and by Shell Chemical Co. Ltd over the past three years have shown that post-blossom application gives an excellent control of the mite as well as capsid and blackcurrant leaf midge, whilst the pre-blossom application of Endrex 20 gives a very good control of aphids, and partial control of big bud mite.

Application of endrin, post-blossom, to blackcurrants grown under contract for juice manufacture is approved. The spray concentration is not to exceed 0.04% endrin, which is provided by 1½ pints of Endrex 20 per 100 gall. water; this application to be made as soon after flowering as possible. On blackcurrants, grown for consumption in any form, a late pre-blossom application of endrin is approved, whilst non-fruiting bushes and plantation stock may be sprayed at any time.

Experimental work by Shell has shown that no residues were detectable chemically, either on the ripe fruit as a result of the pre-blossom application, or in the juice following the immediate post-blossom application. Small residues of endrin were found on the skins of the berries at harvest following post-flowering treatment. In view of this, the Ministry has recommended that pomace, or skins, from blackcurrant juice manufacture should not be used for human consumption, but these recommendations will be reviewed at the end of the year.

Radiation Effects in Organic Systems

RADIATION chemistry of hydrocarbons was considered by Dr. Roberts, with particular emphasis being placed on the inadequacy of free radical mechanisms to account for the products obtained. Ion molecule reactions which were important in this field were discussed.

The relative radiation stabilities of aromatic and aliphatic organic substances were compared and some consideration was given to the protection effect, i.e., the ability of an aromatic substance to "protect" an aliphatic substance from radiation damage.

Various chain systems such as radiation initiated halogenation and oxidation were dealt with by Dr. Roberts and work on the radiolysis of various ethers, ketones and esters was considered.

Finally Dr. Dalton reported on effects which had been found in organic systems with heterogeneous materials, i.e. to various catalysts present when the system was being irradiated.

D.S.I.R. to Give Grants for Longer Terms

LONGER-TERM grants for special researches are to be awarded by the Department of Scientific and Industrial Research. Grants—which have normally been limited to a maximum of five years—may now be awarded for an initial period of up to seven years with a possible further 10 years. First closing date for applications is 1 March.

This change in policy has been made to meet present day needs. The more complex and expensive researches may require support for more than five years to become fully established. When fully established the support for these researches will be transferred from D.S.I.R. to the university; arrangements are being worked out to simplify such transfer.

The department is therefore willing to support for longer periods outstanding university investigators embarking on promising researches for which their universities are unable to make adequate provision.

Debate on Science or the Humanities

THE London section, Royal Institute of Chemistry, the Classical Association and the Haldane Society are combining on 18 March to hold a debate on the motion that 'The education of our future rulers should be primarily in the sciences rather than in the humanities'. Chairman is Professor Sir Cyril Hinshelwood. Proposer of the motion will be Sir Alexander Fleck, with Professor A. R. Ubbelohde as seconder. Opposer will be Professor B. Farrington with Professor W. Beare seconding.

The meeting will be held in the William Beveridge Hall, Senate House, London University, starting at 5.30 p.m. A general debate will follow at 7 p.m.

MONSANTO MARKET NEW FOAMABLE POLYSTYRENE

POLYSTYRENE is now available from Monsanto Chemicals Ltd. in the form of expandable beads which can be converted into a light-weight closed-cell type expanded product.

Bulk density of the expanded form can be controlled to fit the end use of the material, the lowest producible on the commercial scale being of the order of 1 lb. per cu. ft. The expanded product can be produced either as light-weight granules or as compact blocks, boards or moulded shapes.

A two-stage process is used to convert the expandable beads to the fully expanded lightweight products. In the first stage the foamable beads (particle size 0.4 to 1.0 m.m.) are expanded by the action of heat to yield light-weight granules (prefoam). After a short conditioning period the prefoam is caused to expand a second time by the action of heat and to fuse or weld together to give the final compact block or shape.

Blowing Agent

The foamable beads contain a blowing agent necessary to cause expansion under the action of heat into granules with a microcellular structure. To produce first class mouldings, the beads are first converted into the light-weight granules or 'prefoam' which is then moulded into final blocks, etc. The density of the prefoam governs the density of the final moulding, and the aim of the prefoaming stage is to produce a prefoam approximating in bulk density to that of the required moulding. This is achieved by regulating the time and temperature used in the prefoaming stage. When bulk densities of 1 to 2 lb. per cu. ft. are required, steam and boiling water are used, and for densities above 2 lb. per cu. ft., hot water at about 90 to 95°C. Prefoaming can be carried out using infra-red heating, but 1½ to 1¼ lb. per cu. ft. is stated to be about the lowest density achievable with this form of heating.

Equipment required to produce low-bulk densities consists of two to four tanks 2 ft. by 3 ft. to hold boiling water and fitted with removable trays with fine wire gauze, or a steam chest holding two trays. These allow a throughput of 20 to 50 lb. per hour. For continuous prefoaming with boiling water the most convenient equipment is a long cylindrical trough with a hinged cover and containing a slowly rotating screw. The beads are then metered in at one end, the finished prefoam being delivered at the other end. Capacity is 50 to 200 lb. an hour.

Prefoam of density 1 to 2 lb. per cubic foot is stored for at least 24 hours and preferably for 48 hours, but not kept longer than 7 days. Prefoams of density above 3 lb. per cubic foot can be moulded within 12 hours of making, Monsanto claim.

For the final moulding process, two methods are available—the steam process and the hot water process—choice to some extent being governed by the bulk density of moulding required. The steam process, for instance, will deal with the whole range of bulk density from 1 lb. per cubic foot upwards; the hot water process can only be used for densities above 3 lb. per cubic foot, and is used where special shapes and forms are required as distinct from rectangular blocks.

In the steam process, steam is forced into the prefoam contained in a mould of the required shape. A simple mould comprises two steam chests, the inner faces of which are perforated with 1/16 in. diameter holes and separated by a rectangular frame. Large moulds can be constructed by welding ¼ in. steel plate or by casting in aluminium. The mould must withstand the pressure of the steam supply and also the internal pressure developed during the expansion of the foam. Condensed water should be allowed to escape, however, by means of valves at the bottom of the mould. Steam at a pressure of 7 to 10 p.s.i. and a temperature of 110° to 115°C is recommended.

Slow cooling of the mould is required when low density blocks are produced. This can be achieved by cooling the mould externally with water when the mould temperature has fallen to 40°C or blowing compressed air through the plattens of the mould. Finished blocks are stored for 10 to 16 days before slicing to allow any trapped water to diffuse out and allow any further contraction to take place (usually of the order of 0.2% after removal from mould).

Mouldings of 3 lb. per cubic foot and above are prepared using the boiling water technique. The time of immersion in boiling water is determined by the density of the prefoam used and the thickness of the section.

Thickness	Density 3-5 lb./cu. ft. Time in minutes
Up to 1 in.	5—7
1—2 in.	6—10
2—5 in.	10—12
5—10 in.	12—20

The moulds are cooled by plunging them into cold water.

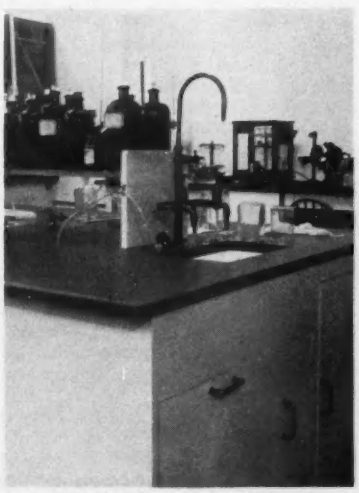
Guide to Bulk Density of Prefoam

Steam prefoaming (supply at 30 p.s.i.)	
1 minute steaming	3 lb./cu. ft.
2 minutes' "	1½ lb./ "
5 " "	1 lb./ "
Boiling water prefoaming	
1 minute in boiling water	2 lb./cu. ft.
2 minutes " " "	1½ lb./ "
5 " "	1 lb./ "
Hot water heating above 2 lb. per cu. ft.)	
1 minute heating	4 lb./cu. ft.
2 minutes "	3 lb./ "
4 " "	3 lb./ "
4 " "	2½ lb./ "
7 " "	2 lb./ "

Stelvetite as Laboratory Material

THE first use of Stelvetite as a construction material for laboratories has been made by Electro-Chemical Engineering Co. Ltd. at a newly completed laboratory at their Sheerwater, Woking, factory.

Stelvetite, developed by John Summers and Sons Ltd., Chester, comprises p.v.c. bonded by a special process to sheet steel and providing a material with the strength of steel with the colour, corrosion resistance and other properties of p.v.c. It has been used by Electro-Chemical Engineering for bench tops, fume-ducting and for the casing of an instrument panel.



One of the bench tops for which Stelvetite was used

The properties of the material make it resistant to acids and alkalis within wide limits as well as to abrasion, humidity, oils and greases. It has good electrical properties, does not support combustion, withstands considerable heat and can easily be cleaned with detergents.

In the construction of the bench tops which are used for plating tests, Stelvetite was formed round a wood base and p.v.c. filler paste used to finish the corners. For the fume-ducting the plastics side was faced internally and the reverse side (electro-zinc coated) was painted, giving an extremely strong ducting that is resistant to corrosion. A d.c. control panel containing voltmeter, ammeter, two rheostats and a rotary selector switch, has been made entirely with the new material.

Electro-Chemical Engineering, who manufacture electro-plating equipment and who supply electroplating and metal cleaning processes, are reorganising their laboratories. The new laboratory in which Stelvetite has been used is the company's routine analytical and service laboratory, the main function of which is to analyse customers' solutions and where plating tests are made.

DEVELOPMENTS IN SYNTHETIC RESIN EMULSIONS BY VINYL PRODUCTS LTD.

USES of some new or modified synthetic resin emulsions and polymer solutions have been under investigation by Vinyl Products Ltd. Butler Hill, Carshalton, Surrey, for some time. Recently the company described in a series of technical service reports their various developments.

Vinyl Products report that the use of Vinamul synthetic resin emulsions and Vinalak polymer solutions in the manufacture of floor maintenance products has led to the development of floor finishes of improved quantity, greater permanence and better application properties. Production has also been simplified by the absence of batch variations in the synthetic raw materials.

The resin emulsion polishes are based on an emulsion of a thermoplastic synthetic resin as the principal film-former. Properties associated with these polishes are stated to be self-gloss, better wearing and non-slip properties and greater adhesion and permanence than wax emulsion polishes. They are said to approach in durability the permanent lacquers based on thermosetting resins or drying oils, but are less expensive, easier to apply and faster drying, with high resistance to scratch making and discoloration.

Two emulsions developed by the company for manufacture of resin emulsion polishes are Vinamul N610 and the ultra-fine particle size emulsion Vinamul N741.

Modified Methacrylate Polymers

Vinamul N610 is based on a modified methacrylate polymer and deposits inherently flexible films, it is reported, thereby avoiding loss or discoloration of external plasticisers. Film hardness can be increased, if desired, by blending with Vinumul N323 (polymethyl methacrylate). If a softer and more flexible resin is wanted, addition of Vinamul N600 (poly-2-ethoxyethyl methacrylate) is suggested. The films formed have good resistance to water-spotting; they are not alkali-sensitive but removal can be obtained by including alkali-soluble resins in the polish.

Vinamul N741 is based on a modified styrene polymer. It is substantially cheaper than Vinamul N610 and has the additional advantage of being freeze-thaw stable. To improve scuff resistance, wax or polythene emulsions or other additives are employed. To improve film integration of this product, plasticisers are required. The choice of plasticisers is related to the type of surface on which the polish will be used. A satisfactory formulation is stated to be a blend of equal parts of dibutyl phthalate, for flexibility, and tributoxyethyl phosphate, for promoting scuff resistance. Ten to 15% of the combined plasticers based on total solids content of the emulsion is suggested, but the amount can be varied to suit the required balance of film hardness and flexibility.

Disadvantages of solvent attack on rubber, asphalt and vinyl tiles often experienced with resin lacquers containing hydrocarbon solvents can be overcome with Vinalak 5254 (polyvinyl acetate) it is reported. Suitably diluted to facilitate application, this synthetic resin can be used successfully, it is claimed, as an alternative to the conventional floor lacquers. It also has the additional advantage of being available as a one pack system (Technical Data Sheet No. T5 gives further information).

Recently, state Vinyl Products, the Fibres Division of Imperial Chemical Industries Ltd., has examined Vinamuls N.6515 and N.6525 as stiffening agents for Terylene filament fabrics. They consider that these synthetic resin emulsions show 'an appreciable improvement' over other resin finishes.

Readily Diluted

Vinamuls N6515 and N6525 are negatively charged emulsions of copolymers of vinyl acetate and vinyl caprate; the emulsions have total solids contents of 56% and can be readily diluted with water. The vinyl caprate content (% of total copolymer) is 15% for N6515 and 25% for N6525. The pH varies between 4.0 and 4.5 for both Vinamuls. These resins also show high temperature stability.

Finishes obtained with these Vinamuls are stated to have good durability to normal domestic laundering and to be superior to urea formaldehyde and melamine-formaldehyde finishes on Terylene. Stiffness is reported as not being significantly reduced after five hand washes of 5 minutes each at 45°C (113°F) using soap and soda, and solutions of Lissapol N or Lissapol C. Ironing largely restores the original handle of the fabric.

As these finishes are unaffected by white spirit, this solvent can be used for dry cleaning; acetone, trichlorethylene and carbon tetrachloride are solvents for the resin and remove the finishes.

Terylene finished with Vinamuls N6515 and N6525 does not readily acquire a static charge, hence soiling is reduced. Creases can be removed by wet or dry ironing (142 to 150°C, 288 to 302°F). In contrast to urea-formaldehyde and melamine-formaldehyde resins Vinamuls N6515 and N6525 are stated not to impair the low flammability characteristics of Terylene.

Conventional techniques are used to apply these emulsions to the fabrics.

Although the resins are fully polymerised, a short heat treatment is stated to improve adhesion and wash resistance of the finish. Curing is carried out for 3 to 4 minutes at 140 to 150°C (284 to 302°F), although temperatures up to 170°C (338°F) may be used for correspondingly shorter periods. The normal precautions used in resin finishing apply to Vinamuls N6515 and N6525, that is, all equipment should be rinsed with water immediately after use as the dried resin films adhere tenaciously.

The properties of the above mentioned emulsions are included in Technical Data Sheet No. 65 and a Technical Service Report No. T.1 gives further information.

Polyvinyl acetate (p.v.a.) has been found to give excellent results in substantive retexturing, and Vinyl Products Ltd. have developed for this purpose Vinamul N9800 which is an aqueous dispersion of p.v.a., containing 50% of resin. It is free from solvents and plasticisers and can be thinned with water in all proportions. The emulsion does not support the growth of micro-organisms and can be stored for long periods without deterioration.

The amount of p.v.a. required to provide a satisfactory handle generally lies between 0.3% and 0.5% on the weight of the garment Vinyl Products report. Experience has shown that 1% p.v.a. solids on the weight of the garments (or 5% of the retexturing emulsions) should be used when the solvent contains 1% soap. Vinamul N9800 is not miscible with dry-cleaning solvents and has to be emulsified in part of the solvent before it can be dispersed in the cleaning fluid. Emulsification of this product in white spirit and perchloroethylene is stated to be simple. Emulsions in trichloroethylene cannot be used for substantive retexturing since p.v.a. is soluble in this solvent. Full details of the use of Vinamul N9800 are given in Vinyl Products Technical Service Report No. F4.

For the production of smear-proof and fully wash-resistant wallpapers of high quality, Vinyl Products have introduced Vinamul synthetic resin emulsions (Vinamuls N6000, N6020-alkali-soluble vinyl acetate-unsaturated acid copolymer emulsions, and Vinamuls N8100, N8107, N8114, N8120—polyvinyl acetate emulsions).

By virtue of good adhesive properties, Vinamul emulsions have been found to improve the pick resistance of the grounds and prints, and are said to be particularly useful for reinforcing low quality sizes. Coated papers are described as having a pleasing sheen, the degree of which can easily be varied. Full technical data is given in Technical Data Sheets No. 60 and No. 81, and in Service Bulletin No. 10.

New in the Vinamul (p.v.a.) emulsion paints range is Vinamul N9700. Paints based on this product are stated to have, in particular, excellent tropical stability. They also have viscosity stability, are easy to apply, have high initial water resistance and claimed not to blister under conditions of high humidity. Like the other emulsions in this range, Vinamul N9700 is stable to borax, acid phosphates and other salts, and is therefore suitable for the formulation of fire-retardant finishes. Additional information can be obtained from Service Bulletin No. 3.

HEAT AND MASS TRANSFER STUDY ON ABSORPTION OF AMMONIA

STUDY of the absorption of anhydrous ammonia vapour into water or aqueous solutions has as practical significance the design of absorption refrigeration plant. Because of the high heat of solution with this system it is necessary to cool the absorbent continuously. The resulting process of simultaneous mass and heat transfer is of considerable interest and has been investigated by Dr. G. G. Haselden and Dr. S. A. Malaty, Department of Chemical Engineering, Imperial College, London S.W.7. They reported their findings in a paper ('Heat and mass transfer accompanying the absorption of ammonia in water') presented at the symposium held by the Institution of Chemical Engineers, at Church House, Westminster, London, on 12 February.

Ruhemann (1), Haselden and Malaty noted, had proposed a design method for cooled ammonia absorbers which used an iterative procedure to allow for wide variation of temperature experienced by the absorbent as it takes in ammonia and rejects heat to cooling water at successive levels in the absorber. Using this method, however, Ruhemann only had values of the mass transfer coefficient measured by Monaweck and Baker (2) for the adiabatic absorption of ammonia into a pool of water. He had therefore been forced to advocate the use of an average value of the mass transfer coefficient (0.28 ft./h) to be assumed constant over the whole length of the absorber together with an empirical value of the overall heat transfer coefficient (103 B.T.U./ft.^{2} h °F), also assumed constants. In their paper Haselden and Malaty reported measurements of these coefficients for solutions flowing as a film down the outside of a vertical tube and discussed the problem of their correlation.

Experimental Absorber

For their experiments the absorber tube was of mild steel, wall thickness of 12 s.w.g. and an overall length of 9 ft. of which not more than half was within the absorber. Flanges sealing the ends of 5 ft. length of Pyrex pipeline were provided with stuffing boxes with p.t.f.e. packings through which the absorber tube passed. The upper flange also carried the liquid distributor. By loosening the packing around the absorber tube, the tube could be moved vertically, thus changing the level of the collector and hence the effective length of the absorber.

Ammonia was withdrawn as vapour from a supply cylinder and expanded through a needle valve to near atmospheric pressure. The absorbent (distilled or de-aerated water or an ammonia solution) flowed by gravity from a constant head reservoir to the liquid distributor.

Preliminary experiments were made to find a tube surface condition which would sustain complete wetting at the low liquid rates necessary in efficient industrial absorbers. First tests were made with an 18/8 stainless steel tube recommended for cooled ammonia absorbers when cooling water is corrosive. It was found that although the tube was carefully degreased before use, and distilled water was fed to the tube at the maximum available rate (0.44 cm.^{2}/s) complete wetting only occurred for a short distance. Roughening the tube by use of emery cloth, followed by degreasing, also proved ineffective. Temporary wetting of either the smooth or roughened tube could be achieved by rubbing the tube with wet scouring powder, but wetting would not start again if the tube surface was subsequently allowed to dry out. 'Blueing' the tube by heating it to redness and quenching in water also produced only temporary wetting. Wetting agents in the distilled water gave no improvement, and in some cases even caused deterioration. 'Blued' mild steel, however, proved to be satisfactory, it was easily wetted and could subsequently be rewetted many times without difficulty. It is thought that 'blueing' had the dual effect of burning away organic contaminants and producing an oxide coating which had a high affinity for water. The minimum wetting rate achieved was 0.105 cm.^{2}/s.

Wetting Rate

The water film appeared to be smooth over the top few inches of the tube, then rippling set in and persisted over the remainder. When absorption of ammonia was taking place, rippling was more violent. Under these conditions a lower minimum wetting rate was possible.

A series of experiments was made in which absorbent flowrate and concentration were varied for a number of tube lengths, cooling water flowrates and inlet temperature being maintained constant. Experiments were also made to test (a) presence of a wetting agent (Teepol); (b) presence of air in the absorber; (c) adiabatic operation; (d) no absorption (heat transfer only from the heated absorbent film).

To permit detailed theoretical treatment of the results and to make accurate absorber design possible point coefficients were calculated. This could only be done to a very limited extent. Average coefficients had to be used to demonstrate, at least qualitatively, the influence of the various process variables.

The point mass transfer coefficient K' was defined by $\overline{N} = K' a_o (C^{*\prime} - C_o)$ (1) The use of a_o as defined ignores the thickness of film and the presence of ripples hence values of K' obtained can be expected to be larger than true values. The point heat transfer coefficient U_o' was defined by $Q_H = U_o' a_o (t_L - t_W)$ (2). The error in a_o due to rippling is not directly significant in this case.

Rigorous values of $\overline{N}$, for calculation of point coefficients, could be derived from plotted concentration and temperature profiles extending the length of the tube, and these were obtained by interpolating between the results of selected experiments for different tube lengths.

To calculate the average coefficients K'' and U_o'' (assumed constant over the tube length being investigated) their values were first estimated and iterative solutions were obtained over the length of the tube for equations (1) and (2) together with the heat balance equation

$$(t_L - t_L^\circ)_{CL} = 1/m_L \, [\overline{N}H - U_o'' \, a_o \, (t_L - t_W)]$$

Where temperature and concentration profiles were available, average coefficients were obtained directly by substituting average values of $(C^{*\prime} - C_o)$ and $(t_L - t_W)$ in equations (1) and (2), the average values being found from the areas between the respective profiles. The Reynolds number for the liquid film was taken as $4\tau/\mu$.

Results

Results obtained: Representative temperature and concentration profiles obtained by interpolation between the results of several series of experiments were given by Haselden and Malaty. Both were for absorbent feed-rate of 50 g./min. but in one the absorbent was distilled water while in the other it contained initially 0.184 lb. of ammonia per pound of solution. In both instances the absorbent temperature rose rapidly until the processes of heat and mass transfer attained dynamic equilibrium at which point the temperature decreased fairly steadily. It was apparent from these profiles, these investigators stated, that small changes of the absorbent inlet temperature would exert only a minor influence on the process of absorption, conditions being controlled mainly by the cooling water temperature and the absorbent concentration.

To isolate the influence of concentration, experimental values of K'' were plotted on the basis of their ratio to the corresponding value of K'' at the same flowrate and temperature but at a reference value of concentration (K_R''). K'' was found to increase with liquid concentration for values up to 30 NH_3. K_R'' (at 80°F) plotted against Reynolds number of the absorbent showed that the mass transfer coefficient increased with tube length in the range 15 to 120 cm. but that influence of Reynolds number in the range 50 to 250 was comparatively small.

The values of K_R'' for a constant tube length of 58.5 cm. and for values of Re between 150 and 250 were plotted against average absorbent temperature. A straight line correlation was obtained in which the mass transfer coefficient was shown to increase slowly with rising liquid temperature. For design purposes, it is stated, the point values of the mass transfer coefficient K' should be used. The

values of K' for the required design should be selected directly from the limited number of tabulated values.

Results compared with theoretical predictions. Danckwert's method (3) of accounting for the effect of heat absorption cannot be applied to Haselden and Malaty's results as it would predict temperature differences between the interface and bulk of the liquid up to 35°F; for longer tube lengths and lower absorbent flowrates, film thickness was insufficient to comply with the deep pool requirements of the penetration theory; no attempt was made to suppress ripples. Nevertheless the value of K_L given by $K_L = 2\sqrt{D/\pi\theta}$ was evaluated for three values of Reynolds number for each of three tube lengths. An average value of $1.4 = 10^{-5}$ cm.²/s was arbitrarily chosen for a concentration of 1 g. mol./l. at 12°C. Values of D at other conditions were calculated by use of Stokes-Einstein law. Viscosity data used were those of Pinevich (4).

The penetration theory is not applicable at l = 58.5 cm., Re = 50 or at l = 119, Re = 50 and 100. In these cases Pigford's equation (5) for long times of contact $K_L = 3.41\ D/z$ was applied. For long tube lengths the value of K'' has been found to exceed the value given by Pigford's equation (5) or the penetration theory, by a factor of 2 to 5. Mixing produced by ripples in the liquid layer is considered to be the only factor capable of explaining the high rates.

The observed increase of K'' with absorbent concentration could not be explained by either the penetration theory or Pigford's equation, it is recorded, both of which would predict a small decrease of K_L with ammonia concentration due to the decrease in D. Similarly the observed large influence of absorber length on K'' could not be explained by any current mass transfer theory based on laminar flow film. In both cases it is suggested that an explanation can be given in terms of the influence of ripples using the mechanism of ripple motion given by Bond and Donald.

Absorbent film heat transfer coefficient. This can be derived from the experimental values of U_o' values by allowing for the resistances of the cooling water film and the tube wall. The cooling water film coefficient (based on outside area of the tube) was calculated to be 510 and 680 B.T.U./ft.² h°F for water temperatures of 68° and 104°F. respectively. Introducing tube wall resistance but ignoring the presence of scale, these values reduce to 410 and 510 B.T.U./ft.² h°F. It was apparent that the absorbent film resistance was in general too small to be measured by the methods used. With values of Reynolds number of 80 and 169 and series 13 results, net absorbent film coefficients were 250 and 525 B.T.U./ft.² h°F respectively, corresponding values of $C^{*\prime} - C_o$ being 0.5 and 2.5%. With the lower flow rate, the film coefficient coincided with experimental accuracy with the coefficient predicted. With the higher flowrate, in which appreciable absorption can occur, the film coefficient exceeded the predicted value by a factor of 1.6.

The effects of introducing air into the absorber shell showed that the heat and mass transfer coefficients decrease rapidly with the addition of air. The heat transfer coefficient is stated to be more susceptible to small air concentration. Where there was no cooling water (adiabatic operation of the absorber) values of K'' were similar to those obtained in normal operation.

Symbols Used

a_o = area of a small element of tube surface (ft.²).

C_L = specific heat of liquid absorbent (normally taken as 1).

C_o = conc. NH_3 in bulk of liquid (lb. NH_3/lb. solution).

$C^{*\prime}$ = equilibrium conc. of NH_3 solution at bulk absorbent film temperature and prevailing pressure (lb. NH_3/lb. solution)

D = molecular diffusivity (ft.²/h).

H = heat of absorption (B.T.U./lb.).

K' = point mass transfer coefficient (ft./h).

K'' = average mass transfer coefficient (ft./h).

K_B'' = average mass transfer coefficient for a mean value of $C = 0.15$ (ft./h).

K_L = liquid film mass transfer coefficient predicted from the penetration theory (ft./h).

l = length of tube (ft.).

m_L = mass flowrate of absorbent (lb./h).

$\overline{N}$ = rate of mass transfer for given section of tube (lb./h).

Q_H = rate of heat transfer for given section of tube (B.T.U./h).

t_L = bulk absorbent temperature (°F).

t_W = bulk cooling water temperature (°F).

U_o' = point overall heat transfer coefficient (B.T.U./ft.² h°F).

U_o'' = average overall heat transfer coefficient (B.T.U./ft.² h°F).

z = film thickness (ft.).

θ = time of contact (s).

μ = viscosity of absorbent at mean film temperature (lb./ft.h).

Γ = mass flow rate of absorbent per unit length of perimeter (lb./h ft.).

REFERENCES

1. Ruhemann, M., *Trans. Instn. Chem. Engrs.*, 1947, 25, 143.
2. Monaweck, J. H. and Baker, E. M., *Trans. Amer. Inst. Chem. Engrs.*, 1929, 22, 165.
3. Danckwerts, P. V., *Industr. Engng. Chem.*, 1951, 43, 1460; *Appl. Sci. Res.*, 1952, 3A, 385.
4. Pinevich, G., *Refrig. Tech.*, 1948, 20, 30.
5. Pigford, R. L., *Trans. Amer. Inst. Chem. Engrs.*, 1941, 37, 25.

W. Germany's Air Pollution Problems

LECTURING to the Institute of Fuel on 25 February, on 'Problems of Air Pollution in Germany,' was Dr. Ing. Heinrich Lent, president, Vereinigung der Grosskesselbesitzer, E.V., Essen, and president of the Clean Air Commission of the Verein Deutscher Ingenieure.

Efficiency of dust arresters and particularly of electric filters, Dr. Lent stated, has unexpectedly dropped. With increasing high temperatures, unstable compounds such as SiO and SiS_2 are formed which in air oxidise to SiO_2 as difficult-to-precipitate fine dust particles. Efficiency of the electro-filter in such cases has decreased to 70% or less although the guaranteed percentage was 98%. The most appropriate remedy, Dr. Lent stated, was to reduce the velocity of the waste gas in the electric filter to below 1m./sec.

Reddish-brown converter-smoke discharged from air purification steel works by blowing with oxygen-enriched wind was also a nuisance. So far two processes had been developed to avoid its elimination. The Bochumer Verein für Gusstahlfabrikation had installed at Bochum a wet mechanical process in their new Bessemer steel works, while at Donawitz, Austria, an electrflic filter was used. To reduce the temperature of the waste gases to the converter a waste-heat boiler has been installed before the electric filter. Both processes involved considerable capital expense, however. The Donawitz process was being installed at the Thomas steel works of the Mannesmann-Hütte at Hucknigen, near Duisberg, and would cost DM6 million.

Sulphur dioxide was the most common air pollutant in West Germany, the total weight of SO_2 at present discharged every year being assumed to be about 2.5 million tons. The Kohlenstoff-biologische Forschungsänstalt at Essen was making continuous gas and control tests in a climate chamber in contrast to these tests and those carried through by Farbwerke Hoechst, at Hattersheim/Main. Tests at the German Clean Air Commission's Biersdorf station were taking place in the open air.

According to Russian observations, Dr. Lent reported, 30% of SO_2 is turned into H_2SO_4 in the air. German observations had proved that the average life of SO_2 in the atmosphere is eight hours. In West Germany, considerably more SO_2 was deposited in the soil by the rain, etc., than was discharged from sulphuric acid plants, metal roasters, etc.

West Germany's Central Electricity Generating Board had processes to avoid the omission of SO_2 from chimneys. Attempts are also being made in Germany to recover SO_2 in concentrated form from the waste gases from large boiler plants. Such attempts deserved special attention as the fuel oils increasingly processed and used in Europe contained much sulphur. So far, however, technically suitable processes for separating the sulphur (present as organic compounds) during or after refining or processing were not known.

As to the reaction of SO_2, SO_3 and vanadium in boiler firing, the main action of SO_3 was to reduce the dewpoint and so cause damage at the boiler outlet. Vanadium as oxide transmitter caused corrosion within the steam superheater specifically at temperatures between 600° and 650°C. As a remedy the ammonia and dolomite were added "with a certain degree of success."

At present, fluorine emissions from the aluminium plant at Rheinfelden on the German-Swiss frontier were causing concern.

Overseas News

NEW FRENCH COMPANY TO MAKE 50,000 TONS A YEAR OF GR-S RUBBER AT BERRE

A NEW French company, Société des Elastomers de Synthès, is to build a synthetic rubber plant at Berre, near Marseilles. Production will amount to 50,000 tons of GR-S rubber a year, compared with French home consumption of 35,000 tons in 1958, most of which was imported from the U.S.

The new company has been formed by a group comprising Shell Française and Produits Chimiques et Raffineries de Berre (two of the Royal Dutch-Shell Group), Cabot Texas Butadiènne and three French tyre firms, Michelin, Dunlop and Kléber-Colombes. The new plant will draw its raw materials from the nearby Shell refinery.

A butadiene plant is already in production near the mouth of the Seine with an output that is planned to reach 20,000 tons a year, or more than double current French consumption. In addition, Ugine and U.S. Rubber announced an agreement in December for the production in France of special rubbers, latex and plastics derivatives of butadiene under licence (CHEMICAL AGE, 20 December, p. 1030).

Finland to Build Titanium Oxide Plant

The Finnish state-owned company Vuorikemia Oy is to build a titanium oxide plant at Pori with a capacity of 16,000 tons a year. It is expected to be operating in two years' time. A sulphuric acid plant to supply raw material to the titanium oxide works will begin operations next year.

Industrial Solvents Plant for Chile

An industrial solvents plant built at Concon, Chile, under the auspices of the Empresa Nacional de Petroleo and with the technical advice of the W. M. Kellogg Co., will have a daily capacity of 22 cubic metres of naphtha solvent No. 3. Other daily figures are: 26 cu. m. naphtha solvent No. 4, 60 cu. m. white petrol, 6.5 cu. m. naphtha solvent No. 7 and 55 cu. m. spirits of turpentine.

New Electrolytic NaOH Chlorine Plant for Rumania

According to the Chamber of Commerce, Rumania, the kilns of the Ocna Muresului works will produce six times more caustic soda and soda ash in 1960 than in 1948; the installations of the Govora integrated soda products works are stated to have an annual capacity of 150,000 tons, and that there is a possibility of doubling this output; the large electrolytic chlorine/caustic soda plant of the Borzesti petrochemical works is due to be in operation shortly; and lastly the commissioning of the Turda electrolytic soda plant is expected to raise this plant's output capacity by five to six times the 1938 output. Also at the Turda works is a new hydrochloric acid installation which has reached the finishing stage, a carbon tetrachloride plant under construction and a new works for production of polyvinyl chloride, due to be commissioned this year.

Production in 1957
(1938 = 100)

	1957
Caustic soda	281
Soda ash	286

Production target 1960
(1955 = 100)

Caustic soda	350-400
Soda ash	400
Chlorine	450-550

Rumania expects to export any surplus production to Austria, Albania, Argentina, Czechoslovakia, Greece, Hungary, Israel, Lebanon, Switzerland, Turkey, the U.S.S.R., etc.

Pure Sodium Alkoxides by U.S.I.'s Dry-Way Process

U.S. Industrial Chemicals Co., New York, U.S., describe a valuable but little-known technique for preparing sodium alkoxides from metallic sodium and alcohol vapours. The process is stated to be economic and a 'dry-way' type. It yields alkoxides of high purity, in contrast to the 16 or 18% alkoxide solutions produced by the usual methods of introducing sodium into liquid alcohols. A technical bulletin published by U.S. Industrial Chemicals Co., gives details of the laboratory technique of passing vaporised alcohols over molten sodium, but sufficient information is included to serve as a guide in designing a pilot-plant.

Du Pont Open Swiss Sales H.Q. in Geneva

A European sales company, Du Pont de Nemours International S.A., with headquarters in Geneva, has been formed by E. I. du Pont de Nemours and Co. Inc.

The Swiss company will help to plan and implement European sales programmes for products to be manufactured by Du Pont subsidiaries in Europe, and for many products manufactured in the U.S. by the parent company. Initially, the company will be concerned with the sale of textile fibres and elastomers. Other products will be added later.

Mr. David H. Conklin, European director of Du Pont's international department, M. Jean Dutoit and M. H. P. Brechbuhl are the directors of the new company.

The announcement follows the recent reorganisation of the Du Pont international department to conduct activities according to two major geographical areas, Europe and Latin America.

Free Sulpholignine Acid In Powder Form

Zellstoffabrik Waldhof, of Mannheim, West Germany, have begun production of free sulpholignine acid in powder form. Up to now only the calcium, sodium, ammonium and aluminium salts have been obtainable. The free acid has a pH of 1.7 in a 10% water solution. It can be used in cases where, for example, it is necessary to introduce a relatively low degree of acidity particularly in a dry substance with the help of an organic acid.

National Starch Products Enlarge Vinyl Resins Plant

National Starch Products Inc. plan a 50% expansion of their vinyl acetate polymerisation plant in Meredosia, Illinois. Mr. Donald D. Pascal, president, said the new facilities would be in operation by March 1959. The company now has three polymerisation plants in operation, and a fourth scheduled for completion in Toronto, Canada, this spring. In addition to Meredosia, locations include, Plainfield, New Jersey, and Slough, Bucks.

The addition to the Meredosia plant will include co-monomer tanks and handling facilities, a new warehouse, and reactor capacity of 4,000 gall. The new addition will be constructed by the chemical plants division of the Blaw-Knox Company, builders of the original plant.

Rohm and Haas Buy Land for Plant in Ontario

Rohm and Haas Chemical of Canada have purchased 210 acres in the Morrisburg, Ontario, area for a plant that may cost $2,000,000. Reeve Don Kyle of Williamsburg Township said the company, a subsidiary of the Rohm and Haas Co., Philadelphia, acquired the land from the Ontario Hydro-Electric Commission. The company manufacture insect poisons, fungicides, Plexiglass, resins and other chemical products.

U.S. Companies' $380m. Income from Patents, Processes, etc.

Gross returns from U.S. patent licensing processes and other technological arrangements with foreign companies in 1957 were $140 million up, 10% more than in 1956. From foreign branches and subsidiaries the figure was $240 million. Chemical and allied products contributed, states the recent U.S. Department of Commerce report, 29% of the $140 million. At least 650 U.S. companies had a share in the $380 million income, obtained by supplying foreign concerns with patents, processes, technology, rented equipment, copyrights and trade marks. At the same time more than 100

U.S. companies in 1957 paid over $20 million for similar rights, etc.

Foreign licensing is seen as growing in popularity and becoming even more profitable in the future. Most of the money in 1957 came from the highly industrialised countries such as the U.K., France and Germany, which bought basic patents and processes for use in large scale production. Of the chemical processes bought, many of these were for drug manufacturing.

Amounts paids in millions of dollars by the U.K. totalled 28.7 (28.6 in 1956). by France 19.3 (18.6), Germany 13.7 (11.8), Canada 16.8 (15.7) and Japan 14.9 (11.8).

Cyanamid File Patent Suits in Belgium and Holland

Patent infringement suits have been filed in Belgium and the Netherlands by American Cyanamid Co. against Lepetit S.p.a., Milan. The suit relates to Cyanamid patents for the production of tetracycline.

Mr. R. T. Bogan, director of marketing, Cyanamid International, stated that the company were pioneers in research, development and production of broad spectrum antibiotics and that they had filed patent applications extensively throughout the world. Lepetit, Mr. Bogan stated, have been producing tetracycline in Italy and had been exporting the antibiotic into certain countries in violation of their patent rights, which had been granted by the government of those countries. Cyanamid have therefore instituted the patent infringement suits. He explained that Cyanamid had not brought a suit against Lepetit in Italy because under existing Italian law, pharmaceutical products and processes for their production are not protected by patents.

Sun Oil/American Viscose Enter Polypropylene Field

Due to enter the polypropylene field in the U.S. with a 20 million lb. plant to be operating this summer are Sun Oil and American Viscose. Site of the new plant is Koppers' polythene facility at Port Reading, New Jersey, where one of two production lines will be modified. Koppers are to operate the unit for AviSun, the new joint company formed by Sun Oil and American Viscose. American Viscose will handle film and fibre operations initially while Sun Oil supply the monomer. The company has been operating a pilot plant at Marcus Hook, Pennsylvania, for some time.

Safe Handling Methods for Phosphorus Pentasulphide

Safe handling practices for phosphorus pentasulphide, a highly reactive intermediate used in making insecticides and organophosphorus compounds, are described in a new safety data sheet available from the Manufacturing Chemists' Association, 1625 Eye Street, N.W., Washington 6, D.C., U.S.

Since phosphorus pentasulphide reacts rapidly with water or with the moisture in the atmosphere to release hydrogen sulphide, a poisonous flammable gas, the manual details safe handling practices for chemical workers. This 14-page safety booklet also describes protective equipment for high gas concentrations, recommends safe handling containers and waste disposal methods. First aid measures and suggestions for physicians are also included.

I.G. Farben Not to Appeal Against General Aniline Decision

The board of control of the IG Farbenindustrie in liquidation have recommended that no appeal should be made on behalf of the company in respect of the recent rejection by the Washington district court in the case of the former IG Farben subsidiary, General Aniline and Film Corporation in the Interhandel lawsuit. This recommendation has yet to be accepted by the company's liquidators, but it is thought they will agree to it. Reasons for this decision are to be announced later.

Work in Full Swing on Pakistan Fertiliser Plant

Work is in full swing on the construction of a fertiliser plant in the Sylhet district of East Pakistan by the Kobe Steel Works, Japan (CHEMICAL AGE, 22 November 1958, p. 869). A railway siding and a permanent jetty on the river Kushiara are being constructed and a network of roads is expected to be completed shortly.

Germans Feeling Nitrogen Competition

Some 400 of the 3,000 employees of the West German Ruhrchemie AG concern, of Oberhausen, are to lose their jobs. The company say the reason is the drop in nitrogen sales owing to an increase of overseas competition, particularly from Greece, Korea and Japan, and a general fall in nitrogen prices since the coming into operation of the Common Market organisation on 1 January.

Three-Nation Plan for Turkish Plant

The Italian companies Sicedison and Oronzio De Nora, Monsanto Chemical Company of St. Louis, and the Turkish Vinylex Ltd., Sirketi, are to build jointly a chemical plant in the neighbourhood of Istanbul.

Degussa Improved Hydrogen Peroxide Process

An improved process for production of hydrogen peroxide by anthraquinone production is claimed by Deutsche Gold- und Silber-Scheideanstalt AG. (Degussa), Frankfurt, West Germany. A methyl-substituted aromatic ketone is used as solvent. The company give as example the hydrogenation (in the presence of a palladium-aluminium oxide catalyst) of 2-ethylanthraquinone dissolved in *p*-(*t*-butyl) acetophenone. Air oxidation of the reduced quinone followed by water extraction produces the starting material plus a 20% solution of hydrogen peroxide (by reduction of the oxygen).

Lime Industry Expansion in Northern Rhodesia

An extensive re-construction programme by Northern Rhodesia Lime Co. Ltd., near Ndola, is reported by Barclays Bank D.C.O. The project, which will cost about £500,000, includes a modern factory and expansion of quarrying.

U.S.S.R. to Stress Polyolefin Production

IN the Soviet Government's plans to raise production in all branches of plastics and synthetic resins in the period to 1965, particular emphasis is placed on facilities for polyolefins, polystyrene, vinyl acetate, polyamides and glass fibres. Other outputs to be increased are: fluorocarbons, epoxides, silicon-based polymers, ion-exchange resins, etc. Research is being carried out in the U.S.S.R. on new polymers, including polycarbonates, certain polystyrenes and polyformaldehyde. This was stated recently by the Soviet scientist Michail Garbar, Moscow.

Of the synthetic fibres, acetyl-cellulose and polycaprolactam (nylon-6) have been developed to the greatest degree. Smaller quantities are produced of Amyd (nylon-66), Nitron (polyacrylonitrile), Chlorin (perchlorvinyl), Lavsan (polyethylene terephthalate) and Enant (a fibre based on amino-carbonic acids). Nylon-6, Amyd, Lavsan and Nitron are to have priority in the expansion programme and the production of acetyl-cellulose will also be increased. Research in this field stresses new fibres based on polythene, polypropylene and fluorocarbons. Experimental quantities are said to have been produced of fibres based on a mixture of cellulose esters and carbo-chain polymers.

Heading the new synthetic rubbers being produced in the U.S.S.R. are the oil-based butadiene-styrene rubber SKS-30 AM; a chloroprene rubber, which polymerises at low temperatures; copolymerised chloroprene-styrene rubber; and liquid thiokols for the production of sealing materials. Work is in hand on the industrial development of isoprene rubbers. The Lebedev Research Institute for Synthetic Rubber is said to have established that rubber may be produced by the addition of carboxyl groups to butadiene-styrene rubber—in fact, with an even better resistance to ageing at high temperatures. Special rubbers now being produced on a semi-commercial scale, include heat-resistant silicon rubber (STK), fluorine rubber, and carboxylate divinyl latex for the impregnation of tyre fabric.

PEOPLE in the news

● DR. T. T. JONES, of the Rideal Laboratories, Newport, has been appointed Monsanto Chemicals Ltd.'s first research scientist, it is announced in the latest issue of *Autoclave*, the Monsanto newspaper. A graduate of the University of Wales, where he gained a Ph.D., he later went to Cambridge, where he worked with Dr. Melville (now Sir Harry Melville) on the polymerisation of vinyl derivatives. For this work he was awarded a Cambridge doctorate. Dr. Jones joined Monsanto in 1955.

● MR. H. G. STAGE and MR. F. TOMPKINS have been appointed directors of Nu-Swift Ltd., Elland, Yorks. Mr. Stage, who is 36, has been overseas marketing manager since 1952, while Mr. Tompkins, who is 44, has been home sales manager since 1954.

● MR. R. C. CHIRNSIDE, F.R.I.C., chief chemist of the Wembley research laboratories of the General Electric Co. Ltd., has been nominated president-designate of the Society for Analytical Chemistry to succeed DR. J. H. HAMENCE at the annual meeting to be held in March. Aged 55, Mr. Chirnside has served on the council on a number of occasions since 1938 and was a vice-president in 1957-58. He has been chairman of the editorial committee of *Analytical Abstracts* since 1953 and was first chairman of the Physical Methods Group when it was formed 12 years ago. A member of the council of the Royal Institute of Chemistry a number of times since 1944, he was a vice-president in 1956-58, and has been an examiner since 1950. Having played a prominent part in the affairs of the International Union of Pure and Applied Chemistry, he was vice-president of section 5 (analytical) from 1953 to 1957 and was hon. secretary of the I.U.P.A.C. congress held at Oxford in 1952. A member of the British National Committee for Chemistry, a Governor of Brunel College of Technology, a member of the advisory committee for chemistry of Chelsea College of Technology, Mr. Chirnside is also a member of the board of studies in chemical engineering of London University. He joined the G.E.C. scientific staff in 1927 from J. and H. S. Pattinson, consulting chemists, Newcastle-upon-Tyne, where he worked with the late Dr. J. T. Dunn.

R. C. Chirnside

● MR. R. EDWIN MCALPINE, a director of Sir Robert McAlpine and Sons Ltd., has been elected chairman of the Nuclear Power Plant Co.

● DR. NYMAN LEVIN has been appointed director of the U.K. Atomic Energy Authority's weapons group. He has been deputy director since he joined the authority in July 1958 from Rank Precision Industries. Among other posts he has held is superintendent of the Admiralty Gunnery Establishment. Dr. Levin succeeds SIR WILLIAM PENNEY, who will succeed SIR JOHN COCKCROFT as member for research when Sir John takes up his appointment as Master of Churchill College, Cambridge.

● The title of reader in crystallography has been conferred on DR. C. H. CARLISLE, M.Sc., D.Phil., in respect of his post at Birkbeck College, London University.

● The British Aluminium Co. Ltd. announce that consequent upon the retirement of MR. H. W. L. PHILLIPS in September next, the following staff changes will be made at the research laboratories, Chalfont Park. MR. A. C. COATES has been appointed assistant director of research (chemical), and MR. P. C. VARLEY assistant director of research (metallurgical). DR. C. E. RANSLEY will be given the title of senior research metallurgist and DR. F. A. CHAMPION that of senior research chemist.

● DR. B. HSU, who joined the Printing, Packaging and Allied Trades' Research Association's printability department in July last year, has gained a Ph.D. degree at Manchester University. Dr. Hsu, who is 29, was working at the university on the viscoelasticity of man-made fibres.

Hugh Gaitskell, Leader of the Opposition, talking to J. C. H. McEntee, chairman I.C.I. Wilton Council, on his recent visit to Wilton Works

● MR. R. A. HAMILTON, who as announced briefly last week will succeed MR. S. W. CHEVELEY on 1 April as chairman of I.C.I.'s Central Agricultural Control, studied agricultural Chemistry at Queen's University, Belfast, from 1928 to 1932 gaining the B.Sc. and B.Agric. This was followed by studies at Cambridge University (Dip.Agric.) and the Imperial College of Tropical Agriculture, Trinidad (A.I.C.T.A.). He spent six years with the Ministry of Agriculture, Northern Ireland before joining I.C.I. as agricultural development director of C.A.C. In 1954 he became visiting director of Pharmaceuticals Division and from 1 January last year has been a director of Billingham Division. He will retain his appointment as Billingham development director.

R. A. Hamilton

● MR. P. R. EWINGS has been appointed chief purchasing officer of the Siemens Edison Swan group. He will be at the Woolwich works.

● The manager of the new extract plant of the Pyrethrum Board of Kenya (CHEMICAL AGE, 31 January 1959, p. 209) is MR. J. HUNTLEY, who was with the constructors of the plant, Rose, Downs and Thompson Ltd., Old Foundry, Hull.

● MR. D. CHESHIRE has resigned his directorships of Hicking Pentecost and Co. and its subsidiaries.

● MR. ALBERT WHITFIELD is taking over as general manager of Widnes Foundry and Engineering Co. Ltd., Lugsdale Road, Widnes. He was appointed a director in 1955. He joined the company in 1938, and became works manager in 1949. The retirement from active duties of the joint managing director, MR. RALPH CREDLAND, is also announced. Mr. Credland will remain on the board in a consultative capacity.

A. Whitfield

● DR. B. F. J. SCHONLAND, F.R.S., deputy director of the Atomic Energy Research Establishment, Harwell, has been elected to an hon. fellowship of Gonville and Caius College, Cambridge.

● MR. E. V. WEEKES, general works manager, Monsanto Chemicals Ltd., Ruabon, has been appointed general manager of manufacturing. Mr. Weekes is an M.Sc. of London University and an associate of the Royal Institute of Chemistry. He joined Monsanto in 1937 and

in 1948 was appointed manager of the fine chemicals group at Ruabon. In 1955 he was promoted works manager and in October 1958 general works manager.

Peter Negretti, managing director Negretti and Zambra Ltd., opens the door of the company's new sports pavilion at Stocklake, Aylesbury

● PROFESSOR P. V. DANCKWERTS, G.C., M.B.E., M.A. S.M., Professor of Chemical Engineering Science, Imperial College, has been elected Shell Professor of Chemical Engineering, Cambridge, from 1 October to succeed PROFESSOR T. R. C. FOX, who has resigned. Professor Danckwerts, who received his training in chemistry at Balliol, Oxford, was—after wartime service on bomb disposal with the R.N.V.R. and with the experimental department, Combined Operations—awarded a Commonwealth fund fellowship and studied chemical engineering at Massachusetts Institute of Technology from 1946-48. He joined the newly founded Department of Chemical Engineering at Cambridge in 1948, leaving in 1954 to become deputy director of research and development in the Atomic Energy Authority's Industrial Group. In 1956 he took up his present chair.

P. V. Danckwerts

● DR. H. J. PLENDERLEITH, keeper of the research laboratory, British Museum, since 1949, is retiring on 28 February to become director of the Unesco International Centre for the Study of the Preservation and Restoration of Cultural Property. DR. A. E. A. WERNER has been appointed to succeed him.

● DR. J. R. EDISBURY, research department, Unilever Ltd., Port Sunlight, was elected chairman of the North of England section, Society for Analytical Chemistry at the recent annual meeting. Other officers elected were: vice-chairman, MR. J. MARKLAND, hon. secretary and treasurer, MR. B. HULME, Ch. Goldrei Foucard and Son Ltd., Brookfield Drive, Liverpool 9. At an ordinary meeting which followed MR. H. E. STAGG, B.Sc., F.R.I.C., spoke on 'Synthetic foodstuff colours—control of quality.'

● In addition to the three recipients of certificates under the Association of Chemical and Allied Industries' scheme of training for qualified chemical operators (see 'Distillates', 21 February) are the following: MR. ROLAND PORTER, who joined Ashburton Chemical Works Ltd. in 1947 and who is now a foreman in the intermediates plant; and MR. W. J. RIDYARD a chargehand in the company's sebacic acid section.

● Head Wrightson and Co. Ltd. announce the following appointments as directors of their subsidiary companies: MR. GEORGE TAYLOR and MR. JOHN D. ECCLES as directors of Head Wrightson Steel Foundries Ltd.; MR. ROGER B. W. BOLLAND as a director of Head Wrightson Colliery Engineering Ltd.; MR. RICHARD O'BRIEN, D.S.O., M.C., as a director of Head Wrightson Stockton Forge Ltd.

● MR. W. B. HORNER formerly sales manager of Southern Instruments Ltd., has been appointed general manager of the analytical department, and will be assisted by MR. G. B. THORPE, B.Sc., late of Plessey, on technical sales, and by MR. J. HETMAN, A.R.I.C., on applications research.

● DR. ZBIGNIEW ZAGORSKI, 32-year-old university lecturer from Poznan, has been awarded a British Council bursary to study in Belfast. He is doing research in microchemistry under PROFESSOR CECIL WILSON, Professor of Analytical Chemistry at the University.

● Sir W. H. Bailey and Co. Ltd., Albion Works, Patricroft, Manchester, announce that MR. S. WATTS, chief draughtsman, has been appointed chief engineer (contracts division) and that MR. B. SCOTT-GARRETT has joined the company as chief engineer (control division).

In Parliament

U.S. Controlled Firms and Antibiotics

NO British companies have applied for licences under Section 41 of the Patents and Designs Act, 1949, to manufacture aureomycin, tetracycline and terramycin, at present being made wholly by U.K.-based subsidiaries of U.S. firms. A reply to this effect was given by Mr. J. K. Vaughan-Morgan, Minister of State, B.o.T., to a question asked in the House by Dr. Dickson Mabon (Lab., Greenock), who also wanted to know if the Minister was satisfied that the present system of restricted production accorded with official policy.

Also, would the Minister of State recognise that many manufacturers were unaware of the existence of the opportunities afforded by this branch of the legislation, and did he not think that the President, B.o.T., should draw the attention of pharmaceuticals manufacturers to this possibility so that prices could be brought down?

Mr. Vaughan-Morgan said the Minister of Health welcomed competition in the supply of drugs, but the Comptroller of Patents could only consider such applications for licences as he received. He added that the facilities were there for those who wished to use them.

Synthetic Detergent Committee to Report Soon

The report of the committee on synthetic detergents in connection with effluent disposal will, it is expected, be submitted in the next two or three weeks, stated Mr. J. R. Bevins, Parliamentary Secretary to the Minister of Housing.

Serious Losses in Harwell's Senior Science Staff Alleged

Asked by Mr. Austen Albu (Lab., Edmonton) if he was aware of serious losses of senior scientific staff at Harwell and that it was said that these losses were due to the fact that the establishment was now dominated by the accountancy and administrative staff, the scientists no longer being able to get on with the job of research, Mr. Harold Macmillan, Prime Minister, said "No, Sir."

He added: "There are, of course, difficulties and there are movements, some of which have value, between industry and the universities. But there certainly has been a very great advance under the present arrangements for the management of atomic affairs by the independent authority."

New D.S.I.R. Committee on Tropical Products

When the Colonial Products Council is dissolved on 1 April, a new D.S.I.R. committee will be appointed to look after the Tropical Products Institute under the new arrangements whereby the institute will be managed by D.S.I.R. (see CHEMICAL AGE, 21 February, p. 324). This was stated in the House last week by Mr. Alan Lennox-Boyd, Colonial Secretary.

Dip. Tech. Courses

A total of 2,491 students are taking courses for the Diploma in Technology, stated Sir Edward Boyle, Parliamentary Secretary, Ministry of Education, in reply to a written question last week. Of this total, five are studying applied biochemistry (one full-time); 194 are studying either applied chemistry, chemical technology, or industrial chemistry (two full-time, seven sandwich courses, 93 first year, 58 second year, 34 third year and nine fourth year); 61 are studying chemical engineering; 19 instrument and control engineering; and 92 metallurgy.

TRADE NOTES

Smoke Eliminator

Lynward Engineering Co. Ltd., 180 Brompton Road, London, S.W.3, are manufacturing under licence smoke eliminators designed and developed by the fuel research station of the Department of Scientific and Industrial Research. Apart from ensuring that smoke emitted conforms with statutory obligations under the Clean Air Act, the installation of these new eliminators is claimed to effect substantial savings.

Two types are available, one for natural draught hand fired boilers, and the other for similar boilers with forced draught. The company are also marketing a new smoke density indicator, also developed by the fuel research station of D.S.I.R., which is said to provide a simple, efficient and immediate means of detecting the emission of dark smoke.

Spray Nozzles

Lechler spray nozzles for atomising liquids in many branches of the chemical industry, as well as in other industries, are listed in a leaflet published by Ascog Ltd., 44 Theobalds Road, London, W.C.1. The nozzles are made from a variety of materials in styles to meet a wide range of requirements. Some of the uses are: steam and gas cooling, gas purification, saturation and absorption, atomisation and mixing of acids, alkalis and other liquids, spray drying.

Plate Evaporator

With their new plate evaporator established in the dairy industry, the A.P.V. Co. Ltd., Manor Royal, Crawley, Sussex, are ready to extend the application of this equipment into other fields.

A full-scale plant has been installed for carrying out tests on customers' products in order to establish the practicability of any particular operation. This plant, which has a capacity of 1,000 lb./hr. is a double-effect type, and is fully instrumented in order that accurate quantitative data can be obtained.

Four-Point Temperature Recorder

Fielden Electronics Ltd., Wythenshawe, Manchester, announce a new transistorised four-point temperature recorder. This has a 10-in. diameter chart and operates from the normal 50 cycles mains supply. Resistance bulbs are used as the temperature sensitive elements and low range spans are easily achieved. The use of transistors has significantly reduced the power dissipated in the instrument and has resulted in improved performance and greater reliability.

New Silicone Compounds

Two new silicone compounds, one a cable rubber, and the other a silicone emulsion, are being made by I.C.I. Nobel Division.

Elastomer E.372 is a 70° shore hardness cable rubber of improved physical properties, particularly in the elongation, which is now 225% after a 24-hours oven-cure at 250°C. Because of its hardness and other good physical properties the rubber is excellent for the sheathing as well as the insulation of cables. It will satisfy an increasing demand for a cable rubber that is capable of indefinitely resisting ambient temperatures from 150°C to minus 50°C.

Silicone emulsion M.401 is designed as a release agent in rubber and plastics moulding and in some kinds of metal moulding. It is said to be more stable at higher temperatures than the emulsions at present in use.

Sole Agents for Syntol

Charles Page and Co. Ltd., of London, Manchester and Glasgow, have been appointed sole agents by the Texas-U.S. Chemical Co. for the U.K. for the sale of Syntol synthetic rubber and for butadiene.

Analytical Instruments

Southern Instruments Ltd., Frimley Road, Camberley, Surrey, have formed an analytical instruments department which will sell equipment designed and manufactured within the company, and also sell, and in some cases manufacture, equipment of outside design. Further developments will follow in the polarographic field. Analytical electronic tools which will become available include the Sigrist and Weiss (Zurich) photometer, suitable for both laboratory and industrial measurement of absorption and turbidity.

Laboratory Furniture

A. Gallenkamp and Co. Ltd., Sun Street, London, E.C.2, have issued a new catalogue of laboratory furniture and fittings. Their unit equipment has been developed to follow recent trends in design, and both timber and metal furniture are now available. Standard furniture units are made in three main finishes, each being available with minor variations to suit six alternative styles of bench assembly.

Dial Thermometers

A speedier delivery service for dial thermometers is announced by Negretti and Zambra Ltd., 122 Regent Street, London W.1. As a result of improved production methods they now keep in stock a number of standard specification rigid stem and distance type Merstell dial thermometers.

Aerosol Display

Sixteen leading companies in the aerosol packaging field are putting on a display at the Packaging Centre, 50 Poland Street, London W.1, from 16 March to 8 April. Together they cover every stage and aspect of the new packaging technique—propellants, valves, glass and metal containers, coatings, formulations, machinery and equipment, contract filling, etc.

Platinum Price Rise Again

During the past week the price of platinum has continued to rise. The latest quotation by the U.K. refiners is £25 an ounce, with 'unofficial' prices as high as £28 15s.

Universal Mixer

Premier Colloid Mills Ltd., Hersham Trading Estate, Walton-on-Thames, Surrey, offer to take their mixers to customers' plant to help to solve any mixing problems involving quantities up to 500 gallons. These demonstrations are offered free.

Magon—New Indicator for Semi-Micro Chelometric Titrations

IN a communication to *Nature* (1959, **183**, 461) Robert H. Maier, Department of Agricultural Chemistry and Soils, University of Arizona, Tucson, presents results of direct titrations of magnesium using the new sensitive indicator, Magon —1-azo-2-hydroxy-3-(2.4-dimethylcarboxanilido)-naphthalene-1′-(2-hydroxybenzene)—marketed by LaMotte Chemical Products Co., Chestertown, Md. U.S.). This indication is stated to form a coloured complex with small amounts of magnesium but not with small amounts of calcium. Magnesium in the complex is removed by titrating with ethylene tetraacetate, resulting in a sharp colour-change of yellow-red to blue-violet to blue. The blue end-point is stated to be slower than the blue-violet but either colour change can be used.

Essentially insoluble in water, Magon is soluble in ethanol and methanol. It is dissolved in methanol and methanol is added to the solution to be titrated (alcohol concentration in the solution to be titrated should range between 30 and 80%). The indicator should be prepared fresh daily.

For the titration a pH range of 9.0 to 11.0 is necessary. Clearest colour-changes are from pH 10.0 to 10.5. In standardisation of EDTA with magnesium the pH should be adjusted to a selected pH within 10.0 and 10.5.

Results indicate that Magon can be used in determining μgm amounts of magnesium, recovery values being satisfactory. Metals such as copper and iron interfere, affecting the sharpness of the end-point, but this can be overcome by adding a small amount of solid potassium cyanide to the solution before adding the Magon. A buffer system, ammonium hydroxide-ammonium chloride, was unsatisfactory because of decreased sensitivity of the end point.

The titration can be used for determining the combined amounts of calcium and magnesium, since calcium is titrated before magnesium. Calcium can be separated from magnesium as the precipitated calcium tungstate. Magon has been shown to be very sensitive for determination of total hardness of waters and Maier suggests that it may be useful in the titration of micro-amounts of other metals.

BRITISH CHEMICAL PRICES

GENERAL CHEMICALS

Acetic Acid. D/d in ret. barrels (tech. acid barrels free); in glass carboys, £8; demijohns, £12 extra. 80% tech., 10 tons, £97; 80% pure, 10 tons, £103; commercial glacial, 10 tons, £106.

Acetic Anhydride. Ton lots d/d, £128.

Alum. Ground, f.o.r., about £25.
MANCHESTER: Ground, £25.

Aluminium Sulphate. Ex-works, d/d, £15 10s to £18.
MANCHESTER: £16 to £18.

Ammonia, Anhydrous. Per lb., 1s 9d-2s 3d.

Ammonium Chloride. Per ton lot, in non-ret. pack, £33 2s 6d.

Ammonium Nitrate. D/d, 4-ton lots, £31.

Ammonium Persulphate. Per cwt., in 1-cwt. lots, d/d, £6 13s 6d; per ton, in min. 1-ton lots, d/d, £123 10s.

Ammonium Phosphate. Mono-and di-, ton lots, d/d, £106 and £97 10s.

Antimony Sulphide. Per lb., d/d UK in min. 1-ton lots: crimson, 4s 9½d d/d to 5s 2½d; golden, 3s ½d d/d per lb. to 4s 5½d d/d.

Arsenic. Ex-store, £45 to £50.

Barium Carbonate. Precip., d/d, 4-ton lots, bag packing, £41.

Barium Chloride. 2-ton lots, £49.

Barium Sulphate [Dry Blanc Fixe]. Precip. 2-ton lots, d/d, £43.

Bleaching Powder. Ret. casks, c.p. station, in 4-ton lots. £30 7s 6d.

Borax. Ton lots, in hessian sacks, c.p. Tech., anhydrous, £68; gran., £46; crystal, £48 10s; powder, £49 10s; extra fine powder, £50 10s; BP, gran., £55 10s; crystal, £57 10s; powder, £58 10s; extra fine powder, £59 10s. Most grades in 6-ply paper bags. £1 less.

Boric Acid. Ton lots, on hessian sacks, c.p. Tech., gran., £76 10s; crystal, £84 10s; powder, £82; extra fine powder £84; BP gran., £89 10s; crystal, £96 10s; powder, £94; extra fine powder, £96. Most grades in 6-ply paper bags, £1 less.

Calcium Chloride. Ton lots, in non-ret. pack; solid and flake, about £15.

Chlorine, Liquid. In ret. 16-17 cwt. drums d/d in 3-drum lots, £41.

Chromic Acid. Less 2½%, d/d UK, in 1-ton lots, per lb., 2s 2½d.

Chromium Sulphate, Basic. Crystals, d/d, per lb., 8½d; per ton, £79 6s 8d.

Citric Acid. 1-cwt. lots, per cwt., £11 5s. 5 cwt. lots per cwt. £11; packed in jute bags or five ply paper bags, both with polythene liners, 1 cwt. lots, per cwt. £10 17s; 5 cwt. lots per cwt. £10 12s.

Cobalt Oxide. Black, per lb., d/d, bulk quantities, 13s 2d.

Copper Carbonate. Per lb., 2s 3d.

Copper Sulphate. F.o.b., less 2% in 2-cwt. bags, £76.

Cream of Tartar. 100%, per cwt., about £11 12s.

Formaldehyde. In casks, d/d, £39 10s.

Formic Acid. 85%, in 4-ton lots, c.p., £91.

Glycerine. Chem. pure, double distilled 1.2627 s.g., per cwt., in 5-cwt. drums for annual purchases of over 5-ton lots and under 25 tons, £11 1s 6d. Refined technical grade industrial, 5s per cwt. less than chem. pure.

Hydrochloric Acid. Spot, per carboy, d/d (according to purity, strength and locality), about 12s.

Hydrofluoric Acid. 60%, per lb., about 1s 2d.

Hydrogen Peroxide. Carboys extra and ret. 27.5% wt., £119 0s 0d; 35% wt., d/d, £143.

Iodine. Resublimed BP, under 1 cwt., per lb., 14s 1d; for 1-cwt. lots, per lb., 13s 2d; 5 cwt., per lb., 12s 8d.

These prices are checked with the manufacturers, but in many cases there are variations according to quality, quantity, place of delivery, etc. Abbreviations: d/d, delivered; c.p., carriage paid; ret., returnable; non-ret. pack., non-returnable packaging; tech., technical; comm., commercial; gran., granular.

All prices per ton unless otherwise stated

Iodoform. Under 1 cwt., per lb., £1 2s 4d, for 1-cwt. lots, per lb., £1 1s 8d, 5 cwt., per lb., 21s 1d, crystals, 3s more.

Lactic Acid. Pale tech., 44% by wt., per lb., 14d; dark tech., 44% by wt., per lb., 9d; chem. quality, 44% by wt., per lb., 12½d; 1-ton lots, ex-works, usual container terms.

Lead Acetate. White, about £154.

Lead Nitrate. 1-ton lots, about £135.

Lead, Red. Basis prices: Genuine dry red, £104 5s; orange lead, £116 5s. Ground in oil: red, £125 5s, orange, £137 5s.

Lead, White. Basis prices: Dry English in 5-cwt. casks, £116; Ground in oil: English, 1-cwt. lots, per cwt., 194s.

Lime Acetate. Brown, ton lots, d/d, £40; grey, 80-82%, ton lots, d/d, £45.

Litharge. In 5-ton lots, £106 5s.

Magnesite. Calcined, in bags, ex-works, about £21.

Magnesium Carbonate. Light, comm., d/d, 2-ton lots, £84 10s under 2 tons, £97.

Magnesium Chloride. Solid (ex-wharf), £17 10s.

Magnesium Oxide. Light, comm., d/d, under 1-ton lots, £245.

Magnesium Sulphate. Crystals, £16.

Mercuric Chloride. Tech. powder, per lb., for 5-cwt. lots, in 28-lb. parcels, £1 1s 9d; smaller quantities dearer.

Mercury Sulphide, Red. 5-cwt. lots in 28-lb. parcels, per lb., £1 10s. 6d.

Nickel Sulphate. D/d, buyers UK, nominal, £170.

Nitric Acid. 80° Tw., £35 2s.

Oxalic Acid. Home manufacture, min. 4-ton lots, in 5-cwt. casks, c.p., about £132.

Phosphoric Acid. Tech. (s.g. 1.700) ton lots, c.p., £100; BP (s.g. 1.750), ton lots, c.p., per lb., 1s 4d.

Potash, Caustic. Solid, 1-ton lots, £95 10s; liquid, £36 15s.

Potassium Carbonate. Calcined, 96/98%, 1-ton lots, ex-store, about £74 10s.

Potassium Chloride. Industrial, 96%, 1-ton lots, about £24.

Potassium Dichromate. Crystal and gran., per lb., in 5-cwt. to 1-ton lots, d/d UK, 1s 2½d.

Potassium Iodide. BP, under 1-cwt., per lb., 8s; per lb. for 1-cwt. lots, 7s 3d.

Potassium Nitrate. 4-ton lots, in non-ret. pack, c.p., £63 10s.

Potassium Permanganate. BP, 1-cwt. lots, per lb., 1s 11½d; 3-cwt. lots, per lb., 1s 10¾d; 5-cwt. lots, per lb., 1s 10½d; 1-ton lots, per lb., 1s 10d; 5-ton lots, per lb., 1s 9½d. Tech., 5-cwt. in 1-cwt. drums, per cwt., £9 15s 6d; 1-cwt. lots, £10 4s 6d.

Salammoniac. Ton lot, in non-ret. pack, £47 10s.

Salicylic Acid. MANCHESTER: Tech., d/d, per lb., 2s 6½d, 1-ton lots.

Soda Ash. 58% ex-depot or d/d, London station, 1-ton lots, about £17 3s.

Soda, Caustic. Solid 76/77%: spot, d/d 1-ton lots, £33 16s 6d.

Sodium Acetate. Comm. crystals, d/d, £91.

Sodium Bicarbonate. Ton lot, in non-ret. pack, £21 10s.

Sodium Bisulphite. Powder, 60/62%, d/d 2-ton lots for home trade, £46 2s 6d.

Sodium Carbonate Monohydrate. Ton lot, in non-ret. pack, c.p., £64.

Sodium Chlorate. 1-cwt. drums, c.p. station, in 4-ton lots, about £88 10s.

Sodium Cyanide. 96/98%, ton lot in 1-cwt. drums, £126.

Sodium Dichromate. Crystals, cake and powder, per lb., 1s. Net d/d UK, anhydrous, per lb., 1s 1¾d. Net. del. d/d UK, 5-cwt. to 1-ton lots.

Sodium Fluoride. D/d, 1-ton lots and over, per cwt., £5; 1-cwt. lots, per cwt., £5 10s.

Sodium Hyposulphite. Pea crystals, £38; comm., 1-ton lots, c.p., £34 15s.

Sodium Iodide. BP, under 1 cwt., per lb., 13s; 1-cwt. lots, per lb., 12s 9d; 5 cwt., per lb., 12s 3d.

Sodium Metaphosphate [Calgon]. Flaked, paper sacks, £133.

Sodium Metasilicate. (Spot prices) D/d UK in 1-ton lots, 1-cwt. free paper bags, £29.

Sodium Nitrate. Chilean refined gran. over 98%, 6-ton lots, d/d c.p., per ton £29.

Sodium Nitrite. 4-ton lots, £32.

Sodium Perborate. (10%0) in 1-cwt. free kegs, cwt. lots, £139 5s.

Sodium Percarbonate. 12½% available oxygen, in 1-cwt. kegs, £170 15s.

Sodium Phosphate. D/d, ton lots: di-sodium, crystalline, £40 10s, anhydrous, £88; tri-sodium, crystalline, £39 10s, anhydrous, £86.

Sodium Silicate. (Spot prices) 75-84° Tw. Lancs and Ches., 6-ton lots, d/d station in loaned drums, £12 10s; Dorset, Somerset and Devon, per ton extra, £3 5s; Scotland and S. Wales, extra, £2 17s 6d. Elsewhere in England, not Cornwall, extra, £1.

Sodium Sulphate [Desiccated Glauber's Salt]. D/d in bags, about £20.

Sodium Sulphate [Glauber's Salt]. D/d, up to £18 10s.

Sodium Sulphate [Salt Cake]. Unground, d/d station in bulk, £10.
MANCHESTER: d/d station, £10 10s.

Sodium Sulphide. Solid, 60/62%, spot, d/d, in drums in 1-ton lots, £36 2s 6d; broken, d/d, in drums in 1-ton lots, £37 2s 6d.

Sodium Sulphite. Anhydrous, £71 10s; comm., d/d station in bags, £27-£28 10s.

Sulphur. 4 tons or more, ground, according to fineness, £20-£22.

Sulphuric Acid. Net, naked at works, 168° Tw. according to quality, £10 10s-£11 12s 6d; 140° Tw., arsenic free, £8 7s 6d; 140° Tw., arsenious, £8 2s 6d.

Tartaric Acid. Per cwt.: 10 cwt. or more, £14 10s; 1 cwt., £14 15s.

Titanium Oxide. Standard grade comm., rutile structure, £178; standard grade comm., anatase structure, £163.

Zinc Oxide. Max. for 2-ton lots, d/d, white seal, £99; green seal, £97; red seal, £94.

SOLVENTS AND PLASTICISERS

Acetone. All d/d. In 5-gal. drums, £128; in 10-gal. drums, £118; in 40-45 gal. drums, under 1 ton, £93; 1-5 tons, £90; 5-10 tons, £89; 10 tons and up, £88; in 400-gal. tank wagons, £85.

Butyl Acetate BSS. 10-ton lots, £173.

***n*-Butyl Alcohol BSS.** 10 tons, in drums, d/d, £149.

***sec*-Butyl Alcohol.** All d/d. In 5-gal. drums, £168; in 10-gal. drums, £158; in 40-45 gal. drums, under 1 ton, £133; 1-5 tons, £130; 5-10 tons, £129; 10 tons and up, £128; in 400-gal. tank wagons, £125.

tert-**Butyl Alcohol.** 5-gal. drums, £195 10s; 40/45-gal. drums: 1 ton, £175 10s; 1-5 tons, £174 10s; 5-10 tons, £173 10s; 10 tons and up, £172 10s.
Diacetone Alcohol. Small lots: 5-gal. drums, £185; 10-gal. drums, £175. 40/45-gal. drums: under 1 ton, £148; 1-5 tons, £147; 5-10 tons, £146; 10 tons and over, £145, in 400 gal. tank wagons, £142.
Dibutyl Phthalate. In drums, 10 tons, d/d, per ton, £210; 45-gal. drums, d/d, 1-4 drums, £216.
Diethyl Phthalate. In drums, 10 tons, per ton, £187 10s; 45-gal. drums, d/d, 1-4 drums, £193 10s.
Dimethyl Phthalate. In drums, 10 tons, per ton, d/d, £179, 45-gal. drums, d/d, per ton £185.
Dioctyl Phthalate. In drums, 10 tons, d/d, per ton £284; 45-gal. drums, d/d, per ton, £290.
Ether BSS. 1-ton lots, drums extra, per lb., 1s 11d.
Ethyl Acetate. 10-ton lots, d/d, £145.
Ethyl Alcohol [PB 66 o.p.]. Over 300,000 p. gal. 4s 0½d; d/d in tankers, 2,500-10,000 p. gal. per p. gal., 4s 2¾d. D/d in 40/45-gal. drums, p.p.g. extra, 1d. Absolute alcohol (75.2 o.p.), p.p.g. extra, 5d.
Methanol. Pure synthetic, d/d, £43 15s.
Methylated Spirit. Industrial 66° o.p.: 500-gal. and up, d/d in tankers, per gal., 5s 10½d; 100-499 gal. in drums, d/d, per gal., 6s 3d-6s 5d. Pyridinised 66° o.p.: 500 gal. and up, in tankers, d/d, per gal., 6s 2d; 100-499 gal. in drums, d/d, pet gal., 6s 6½d-6s 8½d.
Methyl Ethyl Ketone. All d/d. In 5-gal. drums, £183; in 10-gal. drums, £173; in 40/45-gal. drums, under 1 ton, £148; 1-5 tons, £145; 5-10 tons, £144; 10 tons and up, £143; in 400-gal. tank wagons, £140.
Methyl *iso*Butyl Carbinol. All d/d. In 5-gal. drums, £203; in 10-gal. drums, £193; 40-45 gal. drums, less than 1 ton, £168; 1-9 tons, £165; 10 tons and over, £163; in 400-gal. tank wagons, £160.
Methyl *iso*Butyl Ketone. All d/d. In 5-gal. drums, £209; in 10-gal. drums, £199; in 40/45-gal. drums, under 1 ton, £174; 1-5 tons, £171; 5-10 tons, £170; 10 tons and up, £169; in 400-gal. tank wagons, £166.
***iso*Propyl Acetate.** In drums, 10 tons, d/d, £137; 45-gal. drums, d/d, £143.
***iso*Propyl Alcohol.** Small lots: 5-gal. drums, £118; 10-gal. drums, £108; 40/45-gal. drums: less than 1 ton, £83; 1-9 tons, £81; 10-50 tons, £80 10s; 50 tons and up, £80.

RUBBER CHEMICALS

Carbon Disulphide. According to quality, £61-£67.
Carbon Black. UKARB-327-7¼d. per lb. ex-works Swanage, 3 ton lots and over, under 3 tons but not less than 1 ton 7¼lb ex-works, ex-store, London and Manchester, 8¼d per lb.
Carbon Tetrachloride. Ton lots, £83 15s.
India-Rubber Substitutes. White, per lb., 1s 5¾d to 1s 8d; dark, d/d, per lb., 1s 1¾d-1s 5d.
Lithopone. 30%, about £56 10s.
Mineral Black. £7 10s-£10.
Sulphur Chloride. British, about £50.
Vegetable Lamp Black. 2-ton lots, £64 8s.
Vermilion. Pale or deep, 7-lb. lots, per lb., 15s 6d.

COAL TAR PRODUCTS

Benzole. Per gal., min. 200 gal., d/d in bulk, 90's, 5s. 3d; pure, 5s 7d.
Carbolic Acid. Crystals, min. price, d/d bulk, per lb., 1s 4d; 40/50-gal. ret. drums extra, per lb., ¼d. Crude, 60's, per gal., 8s 4d..
MANCHESTER: Crystals, d/d, per lb., 1s 4d-1s 7d; crude, naked, at works, 8s 5d.
Creosote. Home trade, per gal., according to quality, f.o.r. maker's works, 1s-1s 9d. MANCHESTER: Per gal., 1s 2d-1s 8d.
Cresylic Acid. Pale 99/100%, per gal., 6s 6d; 99.5/100%, per gal., 6s 8d. D/d UK in bulk: Pale ADF, per imperial gallon f.o.b. UK, from 7s 8d to 9s 3d; per US gallon, c.i.f. NY, 100 to 118.5 cents freight equalised.
Naphtha. Solvent, 90/160°, per gal., 5s. 1d; heavy, 90/190°, for bulk 1,000-gal. lots, d/d, per gal., 3s 11d. Drums extra; higher prices for smaller lots.
Naphthalene. Crude, 4-ton lots, in buyers' bags, nominal, according to m.p.: £19-£30; hot pressed, bulk, ex-works, £40; refined crystals, d/d min. 4-ton lots, £65-£66.
Pitch. Medium, soft, home trade, f.o.r. suppliers' works, £10 10s; export trade, f.o.b. suppliers' port, about £12.
Pyridine. 90/160, per gal., 15s-17s 6d.
Toluol. Pure, per gal., 5s 2d; 90's, d/d, 2,000 gal. in bulk, per gal., 4s 11d. MANCHESTER: Pure, naked, per gal., 5s 6d.
Xylol. According to grade, in 1,000-gal. lots, d/d London area in bulk, per gal., 6s-6s 3d.

INTERMEDIATES AND DYES

(Prices Nominal)

m-**Cresol** 98/100%. 10 cwt. lots d/d, per lb., 4s 9d.
o-**Cresol** 30/31°C. D/d, per lb., 1s.
p-**Cresol** 34/35°C. 10 cwt. lots d/d, per lb. 5s.
Dichloraniline. Per lb., 4s 6d.
Dinitrobenzene. 88/99°C., per lb., 2s 1d.
Dinitrotoluene. Drums extra. SP 15°C., per lb., 2s 1½d; SP 26°C., per lb., 1s 5d; SP 33°C., per lb., 1s 2½d; SP 66/68°C., per lb., 2s 1d.
p-**Nitraniline.** Per lb., 5s 1d.
Nitrobenzene. Spot, 90 gal. drums (drums extra), 1-ton lots d/d, per lb. 10d.
Nitronaphthalene. Per lb., 2s 5½d.
o-**Toluidine.** 8-10 cwt. drums (drums extra), per lb., 1s 11d.
p-**Toluidine.** In casks, per lb., 6s 1d.
Dimethylaniline. Drums extra, c.p., per lb., 3s 5d.

Obituary

MR. GEORGE W. I. NOKES, general manager of Peabody Ltd., combustion and chemical engineers, 300 Vauxhall Bridge Road, London S.W.1, has died at the age of 54. He joined the company as sales manager 13 years ago from Berry Wiggins.

SIR GEORGE BEHARRELL, D.S.O., former president of the Dunlop Rubber Co., has died at the age of 85. He joined Dunlop in 1922 and the following year was appointed managing director. He held this position until 1957, when he became chairman. From 1949-57, he was the company's president.

DR. W. H. MILLS, F.R.S., fellow and president of Jesus College, Cambridge, from 1940-48 and emeritus reader in stereochemistry, died on 22 February at the age of 85. Dr. Mills was president of the Chemical Section, British Association, in 1932, and of the Chemical Society in 1943-44. He received the Chemical Society's Longstaff Medal in 1930 and the Davy Medal of the Royal Society in 1935.

MR. AUGUSTUS JAMES MARKS, managing director of A. H. Marks and Co. Ltd., chemical manufacturers, Wyke, Bradford, on 16 February.

DIARY DATES

MONDAY 2 MARCH

C.S.—Cambridge: Univ. Chem. Lab., 5 p.m. 'Mass spectrometric investigation of free radicals', by Dr. A. J. B. Robertson.
C.S.—Cardiff: Univ. Coll., 5.30 p.m. 'The chemistry of vitamin B_{12}', by Prof. A. W. Johnson.
C.S. with Univ. Alembic Club—Oxford: Inorganic Chem. Lecture Theatre, 8.15 p.m. 'Recent developments in the inorganic chemistry of fluorine', by Dr. A. G. Sharpe.
S.C.I.—London: 14 Belgrave Sq., S.W.1, 6.30 p.m. Jubilee memorial lecture, 'Colonial research—products and pesticides', by Dr. R. A. E. Galley.

TUESDAY 3 MARCH

C.S. with R.I.C. and S.C.I.—Belfast: Queen's Univ., Dr. J. L. Moilliet.
C.S.—Leeds University, 6.30 p.m. 'Interaction of some gases at the surface of metals', by Dr. F. C. Tompkins.
S.A.C.—Birmingham: the University, 6.30 p.m. Midlands section annual general meeting.
S.C.I.—London: 14 Belgrave Sq., S.W.1, 6.30 p.m. 'Aspects of polymer fractionation', by Dr. J. H. Green.

WEDNESDAY 4 MARCH

I.Chem.E.—Birmingham: Coll. of Tech: 6.30 p.m. 'Reynolds' analogy and mass transfer', by Prof. F. H. Garner, V. G. Jenson and R. B. Keey.
Inst. Fuel—Hull: Royal Station Hotel, 2.30 p.m. 'Treatment of water for the prevention of scale and corrosion, with particular reference to cooling water', by Mr. G. T. Peat.
Inst. Metal Finishing—Glasgow: 39 Elmbank Cresc., 7.30 p.m. 'Deposition of precious metals', by Mr. R. R. Benham.
S.C.I.—London: 14 Belgrave Sq., S.W.1, 6.30 p.m. 'The diagnosis of the causes of corrosion failures', by Mr. J. B. Cotton, Mr. R. A. Hine, Mr. E. E. White and Mr. K. A. Chandler.

THURSDAY 5 MARCH

C.S. with R.I.C.—Middlesbrough: Constantine Tech. Coll., 7.30 p.m. 'Research on the treatment of phenolic effluents', by Dr. D. A. Hall.
C.S. with R.I.C. and S.C.I.—Bristol: the University, 6.30 p.m. 'Some aspects of modern refinery operations', by Mr. D. T. Leahy.
C.S. with Univ. C.S.—Swansea: Univ. Coll., 5.30 p.m. 'The influence of structure on infra-red spectra', by Dr. L. J. Bellamy.
C.S. with Univ. Student C.S.—Hull: the University, 6 p.m. 'The stability of metal complexes', by Dr. H. M. N. H. Irving.
Plastics Inst.—Southampton: the University, 7.30 p.m. 'Plastics in the building industry', by Mr. D. B. Honeyborne.
Polarographic Soc.—London: Duke of York, 8 Dering St., W.1, 7 p.m. 'Some polarographic problems encountered in agricultural studies', by Mr. R. Peak.
R.I.C.—West Ham: Coll. Technology, 6.30 p.m. Films on glass crystallisation and sulphur.
R.I.C. with Inst. Petroleum—Chatham: Medway Coll. Technology, 7 p.m. 'Automation in analysis', by Mr. D. A. Patient.
Royal Society—London: Burlington House, W.1, 4.30 p.m. 'The nature conservancy as a research council', by Mr. E. M. Nicholson.
S.C.I.—London: 14 Belgrave Sq., S.W.1, 6.15 p.m. 'The microbe's contribution to cancer research', by Prof. G. F. Gause, Moscow. Informal dinner at Cadogan Hotel to follow.
S.C.I.—Nottingham: Gas showrooms, 7.30 p.m. 'Structural studies on some carbohydrates of medical significance', by Prof. M. Stacey.
Soc. Instr. Tech.—London: Manson House, Portland Pl., W.1, 6 p.m. Symposium on the use of data recorded on industrial plant.

FRIDAY 6 MARCH

C.S. with R.I.C.—Newcastle: King's Coll., 6.30 p.m. 'The teichoic acids', by Prof. J. Baddiley.
C.S. with Univ. C.S.—Birmingham: the University, 4.30 p.m. 'X-ray analytical evidence on the exact conformation of molecules', by Dr. Dorothy M. Hodgkin.
C.S. with Univ. C.S.—Cambridge: Univ. Chem. Lab., 8.30 p.m. 'The interface between a metal and an electrolyte', by Prof. N. F. Nott.
C.S. with Univ. C.S.—Southampton: the University, 5 p.m. 'Nitric oxide complexes', by Dr. J. Lewis.
Plastics Inst.—Manchester: Textile Inst., 6.45 p.m. 'The manufacture and uses of Stolvetite', by rep. J. Summers Ltd.
Royal Inst.—London: 21 Albemarle St., W.1, 9 p.m. 'Metal surfaces', by Dr. Ronald King.
S.A.C.—London: Burlington House, W.1, 2.30 p.m. Annual general meeting, address of retiring president, Dr. J. H. Hamence. Fishmongers' Hall, London Bridge, 7.45 p.m., biennial dinner.
S.C.I.—Belfast: annual general meeting.
S.C.I.—Exeter: the University, 4.30 p.m. Annual general meeting.
S.C.I.—Glasgow: Ryl. Coll. Sc. and Tech., 7 p.m. Annual business meeting; 7.30 p.m. 'Nobel began it', by Dr. J. Crail.

Commercial News

Boots Pure Drug Co.

Boots Pure Drug Co. are paying a second interim dividend for the half year ending 31 March 1959, of 3% less tax. It is being maintained at this level to reduce the disparity between the interim and final dividend payments, and there is no implication in regard to the total dividend for the year.

British Industrial Plastics

British Industrial Plastics Ltd., who are engaged in the thermosetting side of the industry, are to extend their activities to other sides, the chairman, Mr. E. R. Crammond, says in his statement to shareholders. He states that B.I.P. will have a substantial, but not controlling, interest in the new company to be formed jointly, as already announced, with the Netherlands concern Algemene Kunstzijde Unie, N.V. The company will build a factory for the manufacture of urea formaldehyde and melamine formaldehyde moulding powders and resins to supply the European Economic Community.

Gas Purification

A net profit before tax of £223,208 for the half year to 31 December is reported by the Gas Purification and Chemical Co. Profit for the second half of the financial year may not be at the same rate because of possible seasonal trading factors. The improvement has been achieved by reorganisation resulting in increased efficiency and turnover. A loss on trading of £135,340 before tax was incurred for 1957-58, but trading at a loss virtually ended in the second half of that year.

Monsanto Chemicals

Group trading profit and other income of Monsanto Chemicals Ltd. rose from £3,256,574 to £3,499,744, but due to heavier provisions for depreciation and obsolescence and for interest charges, the net profit, after tax charges, shows a reduction from £1,078,557 to £992,415.

An unchanged second interim of 8½% is also announced, making a total of 13½% for 1958, as previously, on the £5.4 million ordinary capital.

Net sales to the company itself amounted to £15,426,633, or slightly lower than the record £15,683,272 achieved in 1957. Direct export business accounted for 35% of total sales, a contribution of £5,429,222 to turnover, albeit at lower profit margins, reports Sir Miles Thomas, chairman. He states also that the year was one of consolidation of manufacturing resources. Opening of new plants for new products occupied much of the company's effort. The resultant ability to reach new or expanded markets, however, should strengthen its position in the increasingly competitive situation now faced.

Power-Gas Corporation Ltd.

Though orders booked in the year to 30 September 1958 at £9.25 million were only 73% of the high levels of 1956 and 1957, '1959 has dawned with a brighter outlook than was foreseen a few months ago,' Mr. W. R. Brown, chairman of the Power-Gas Corporation Ltd., says in his annual statement.

Shareholders looking at a gross profit some 30% up on last year's figure would be wrong to infer that the whole of the increase represented additional profitability to the business, he says. Profits in any one year depended largely on long-term contracts booked several years before. Much of the present profit came from such contracts and there were others whose full effects would not appear until the 1959 accounts and even the 1960 accounts, were published.

The chemical plant division had experienced renewed activity, booking orders for most of the company's specialities, e.g., gas reforming, CO_2 production, sulphuric acid, glycerine and crystalliser plant.

United Indigo and Chemical

United Indigo and Chemical Co. are to repay 2s 6d each on each of the 240,000 5% participating preference 7s 6d shares and 8d on each of the 525,000 ordinary 2s shares.

Canadian Industries

Canadian Industries Ltd. net profit for the year ended 31 December 1958 amounted to $5,170,000 equal to 58 cents per common share, compared with $8,662,000 or 98 cents a share the year before. Consolidated sales totalled $140,756,000 ($142,653,000). Operating income amounted to $9,723,000 ($14,113,000) and investment income was $194,000 ($171,000).

Mr. Peter C. Allen, president, states that sales of explosives were lower, reflecting reduced demand coupled with the greater use of blasting agents prepared at the point of consumption. Sulphuric acid and nitric acid sales were substantially increased by the new market for these products in uranium refining. However, during the last quarter of 1958, a strike at the smelter supplying the essenraw material made it necessary to shut down the sulphuric acid and liquid sulphur dioxide plants at Copper Cliff, Ontario.

Domestic sales of polythene and Terylene polyester fibre improved, but shipments to foreign markets were much reduced.

Higher manufacturing and distribution costs and the effect of strikes at the plants of important suppliers and customers and at one of the company's plants were mainly responsible for the sharp drop in earnings.

Operating and equipment difficulties at the company's Millhaven, Ontario, ammonia plant prevented sustained output, while start-up costs at other new plants and expenses for the development of polyester fibre continued at a high level.

Approximately $12,000,000 was spent on plants and equipment compared with $15,600,000 the previous year.

(*Continued on page* 369)

- **B.I.P. Will Not Control New Dutch Company**
- **Gas Purification Profits Show Recovery**
- **Monsanto Sales Just Below 1957 Record**
- **Brighter Outlook for 1959 say Power-Gas**

Market Reports

NEW U.K. TRADE IS SATISFACTORY

LONDON Steady trading conditions have been reported for most sections of the industrial chemicals market with contract deliveries and new business for home account satisfactory for the period. Export demand for chemicals continues at about the recent level. There have been no important price movements and the undertone is firm.

There has again been some improvement in the demand for fertilisers, and most of the coal-tar products are enjoying a quietly steady demand.

MANCHESTER On the Manchester market for heavy chemical products during the past week a quietly steady movement of most lines on home-trade account has been reported, and traders have been handling a moderate number of fresh inquiries. Export business shows little change compared with recent weeks, the movement to leading outlets being on a fairly satisfactory scale. Prices generally continue on a steady to firm basis. In the market for fertilisers there is increased pressure for supplies of sulphate of ammonia and other nitrogenous materials and the compounds are moving in good quantities.

GLASGOW Trading conditions on the Scottish heavy chemical market have been more or less unchanged. The week opened steady and did show some progressive improvement towards the end. Demands were up to the usual current and contract quantities and some interest was shown also in forward requirements.

Prices showed little change and mostly remained firm. The overseas market continued fairly active with the usual volume of varied enquiries. There has been little change to report in regard to agricultural chemicals.

Commercial News

(*Continued from p. 368*)

INCREASES OF CAPITAL

FREDERICK ALLEN AND SONS (POPLAR) LTD., Phoenix Chemical Works, Upper North Street, London E.14. Increased by £15,000 beyond the registered capital of £10,000.

CHEMICALS AND FEEDS LTD., Adelaide House, King William Street, London E.C.4. Increased by £7,500 beyond the registered capital of £42,500.

LONDON GAZETTE

Partnership Dissolved

SOUTHERN INDUSTRIAL SUPPLIES, distributors of oils and acids, Fareham Road, Wickham, Hants. Partnership between L. C. Cook and S. G. Lee dissolved by mutual consent as from 1 January. All debts due to and owing by the firm will be received and paid by L. C. Cook, 51 Stubbington Avenue, North End, Portsmouth, who will carry on the business.

Voluntary Winding-up

Notice of the voluntary winding-up of a company is purely formal and does not imply insolvency. It is frequently purely for purposes of internal reorganisation.

ELECTROFACT LTD., manufacturers and distributors of pH equipment, regd. office, 39 Dover Street, London W.1. By special resolution, 5 February. P. L. Oliver, 39 Dover Street, W.1, appointed liquidator.

CIRCULAR GAS CHROMATOGRAPH DEVELOPED IN U.S.

A CHROMATOGRAPHIC column connected head to tail is described by R. S. Porter and J. F. Johnson, California Research Corporation, Richmond, California (*Nature*, 1959, **183**, 391). In operation, the carrier gas is brought to a desired initial pressure using a stopcock arrangement that is also utilised for sampling. A laboratory peristaltic-type pump in the circuit circulates carrier gas previously introduced. A bleed stream of carrier gas from a separate source is used in the reference side of a resistance wire thermal-conductivity detector. The columns are packed with crushed insulating brick of conventional size. Temperature control is by either liquid or air baths.

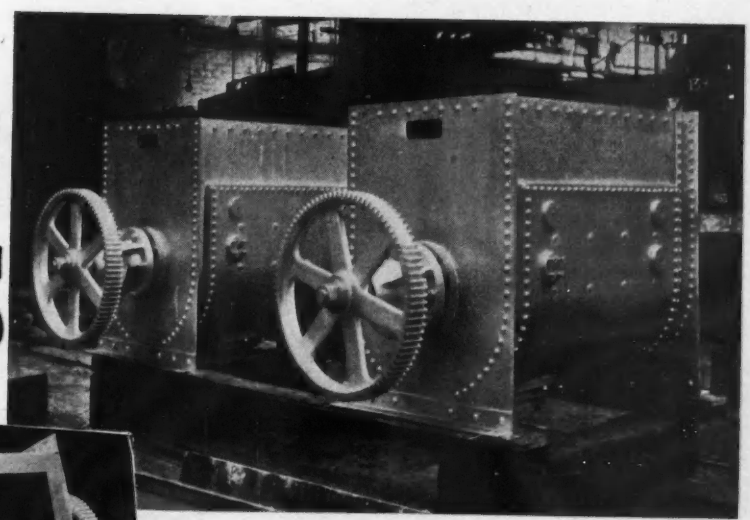
Porter and Johnson point out that the stationary liquid phase normally used in gas chromatography has a low volatility relative to the compounds being separated. With the circular apparatus, the liquid need not have volatility, they report.

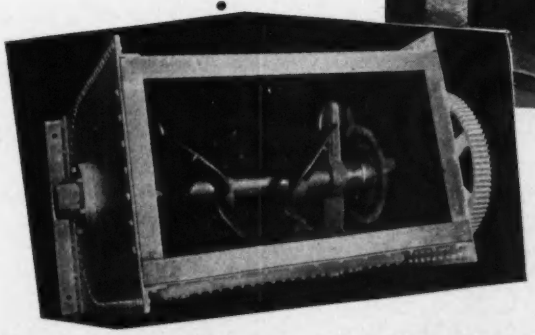
In one experiment carried out using this apparatus, retention time of normal heptane was 4.5 minutes for the solid support coated with methanol, and 0.5 minutes for the support with no liquid present under the same conditions. The methanol clearly was acting in the tests as a partitioning liquid.

There are several advantages in being able to use volatile partitioning liquids, these workers note. Thus, a wider range of liquids can be utilised. Also, non-analytical chromatographic applications are often of more interest if there is less difference in the boiling points of the liquid phase and the partitioned components. Experimentally, Porter and Johnson record, volatile partitioning liquids can be added through the sample injection septum. Dead volume in the detector cell and mixing action of the pump cause a loss in efficiency as compared to a single pass through a straight column chromatograph.

Column efficiency has been evaluated, using 2,4-dimethylsulpholane as the liquid phase in a circular 10-ft. column. The efficiency was found to increase linearly with the number of cycles up to a length of column equivalent to 150 ft. The circular gas chromatograph is stated to offer a means of operating the equivalent of a long column at a low and more efficient ratio of the initial pressure to that at the outlet; on a preparatory scale it conserves solid support, liquid phase, carrier gas and the energy required for thermostatic control. The equipment can be made automatic.

MIXING VESSELS





These hot water jacketed Mixing Vessels (capacity ½ Ton each) are for use in chocolate manufacture. The lower photograph shows the stirring gear. We manufacture Mixers, Blenders and Process Vessels for a wide range of Industries and applications.

POTT, CASSELS & WILLIAMSON LTD · MOTHERWELL · SCOTLAND

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London W.C.2, price 3s 6d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection 8 April

Methods of producing aldehydes. Philips' Gloeilampenfabriken N.V. **811 527**

Dithiophosphoric acid esters and their preparation. Farbenfabriken Bayer A.G. **811 529**

Preparation of enol esters from ketosteroid compounds. Organon Lab., Ltd. **811 531**

Evaporator for use in the distillation of sea water. Maxim Silencer Co. **811 474**

Production of antibiotic 101a by fermentation. Upjohn Co. **811 757**

Polybenzoxazoles and method of preparing same. Du Pont De Nemours & Co., E. I. **811 758**

Organic titanium complex and method of making same. National Lead Co. **811 425**

Preparation of lime water. Hamon, M. **811 449**

Triazole derivatives. Farbenfabriken-Bayer A.G. **811 765**

Organic titanium complex and method of making same. National Lead Co. [Addition to 811 425.] **811 426**

Plastics compositions. Ferro Chemical Corp. **811 532**

Production of polyvinyl acetate. Du Pont De Nemours & Co., E. I. **811 535**

Process for the gasification of finely divided carbonaceous solid, liquid or gaseous fuel. Koppers Co., Inc. **811 603**

Preparing stainless steel and aluminium alloy surfaces for use in contact with concentrated hydrogen peroxide. Food Machinery & Chemical Corp. **811 604**

Butyl rubber co-vulcanisates. Esso Research & Engineering Co. **811 536**

Method for hydrolysing dextran. Commonwealth Engineering Co. of Ohio. **811 770**

Production of substituted ureas. Du Pont De Nemours & Co., E. I. **811 681**

Preparation of resinous aromatic polyether-alcohols and products thereby obtained. Dow Chemical Co. **811 567 & 811 569**

Phenolic synthetic resin drying oils. Dow Chemical Co. **811 568**

Stabilised compositions comprised of copolymers of styrene and acrylonitrile and method for their preparation. Dow Chemical Co. **811 683**

Coating process for polyethylene and composite articles obtained thereby. Dow Chemical Co. **811 684**

Wet starch manufacturing process. Corn Products Refining Co. **811 686**

Silicon-containing compounds and synthetic resins produced therefrom. Siemens-Schuckertwerke A.G. **811 687**

Method for purification of glutamic acid. Kyowa Hakko Kogyo Kabushiki Kaisha. **811 688**

Manufacture of morphinane derivatives, and morphinane derivatives. Hoffman-La Roche & Co., A.G., F. **811 689**

Production of 1-nitronaphthalene-6-sulphonic acid and 1-naphthylamine-7-sulphonic acid. Farbenfabriken Bayer A.G. **811 691**

Chlorobenzimidazolone compounds. Parke, Davis & Co. **811 692**

Surface-active materials. Shawinigan Chemicals, Ltd. **811 693**

Granulating or pelletising disc. Metallgesellschaft A.G. **811 610**

Mixing apparatus and process for producing polyurethane plastics. Farbenfabriken Bayer A.G. [Addition to 769 682.] **811 695**

Production of compounds of the vitamin-A series. Badische Anilin- & Soda-Fabrik A.G. **811 697**

Pyrrolidine derivatives and a process for the manufacture thereof. Hoffman-La Roche & Co. A.G., F. **811 698**

Process and apparatus for the manufacture of sulphoalkylesters of fatty acids. General Aniline & Film Corp. **811 699**

Production of heterocyclic carboxylic acids of the pyrazolidine series as well as the esters and salts thereof. Geigy A.G., J.R. **811 700**

Continuous crystallisation of solids from their solutions. Nederlands: Directie Van De Staatsmijnen [Handelend Voor En Namens De Staat Der Nederlanden]. [Addition to 664 376.] **811 589**

Substituted thioxanthene a process for its production, and acid salts thereof. Wander A.G., Dr. A. **811 624**

Process and apparatus for the continuous separation of gas mixtures by means of gas chromatography. Deutsche Erdol-A.G. **811 627**

Production of high molecular weight thermoplastic polycarbonates. Farbenfabriken Bayer A.G. [Addition to 808 486.] **811 628**

Isomerisation process. Esso Research & Engineering Co. **811 629**

Open to public inspection 15 April

Separation of gaseous mixtures. Imperial Chemical Industries, Ltd., Labrow, S., Dunn, J. F., Lipscomb, R., Craig, A., and Appleton, E. V. [Cognate application 13 872]. **811 930**

Uranium alloys. Allen, N. P., and Grogan, J. D. **811 841**

Removal of ruthenium from solutions of metal nitrates in organic solvents. U.K. Atomic Energy Authority. **811 771**

Extraction of metal compounds from aqueous solutions. U.K. Atomic Energy Authority. **811 772**

Catalytic desulphurisation of petroleum hydrocarbons. British Petroleum Co., Ltd., Northcott, R. P., and Honsan, E. C. **811 933**

Catalytic desulphurisation of petroleum hydrocarbons. British Petroleum Co., Ltd., Northcott, D. P., and Geach, C. J. **811 934**

Process for the alkylation of amines. Industriechemie Thoma G.m.b.H. **812 058**

Process of electrolytically producing oxide coatings on aluminium and aluminium alloy articles. Sanford Process Co., Inc. **812 059**

Method of producing soapless greases. Continental Oil Co. **812 060**

Treatment of thermoplastic synthetic materials. Steigerwald, K. H. **811 844**

Hydroxy-steroids and process for their manufacture. Ciba Ltd. **811 845**

Hydrazides and thiosemicarbazones. Pharmaceutici Italia S.A. **811 780**

Continuous production of crystalline substances. Farbenwerke Hoechst A.G. **812 062**

Production of chloramphenicol and similar compounds. May, P. (Boehringer & Soehne G.m.b.H., C. F.). **811 846**

Cyanoethylation of cellulosic materials. American Cyanamid Co. **811 063**

Production of substance of high molecular weight. Steigerwald, K. H. **811 847**

Ceramic materials for radiation shielding. Plessey Co., Ltd. **811 782**

Production of aromatic aldehydes. Harpener Bergbau-A.G. **812 064**

Manufacture of substituted β-mercapto-ethyl-thiolphosphoric acid-dialkylates. Farbenfabriken Bayer A.G. **812 065**

Modified polypropylene. Montecatini Soc Generale per l'Industria Mineraria e Chimica. **811 848**

Ketone synthesis. Esso Research & Engineering Co. **811 850**

Manufacture of chlorinated aliphatic hydrocarbons. Farbwerke Hoechst A.G. **811 851**

Salts of phosphorus anhydride acids and process for their production. Henkel & Cie G.m.b.H. **811 937**

Filters. Fas-Flo Filter Corporation. **811 998**

Method of epoxidation of esters. Rohm & Haas Co. **811 852**

Diagnostic composition. Mills Laboratories, Inc. **811 938**

Purification of oxo synthesis products. Badische Anilin- & Soda Fabrik A.G. **811 939**

Converters for liquidfied gases. Aro Equipment Corporation. **812 002**

Production of copper coatings on base metals. Dehydag Deutsche Hydrierwerke G.m.b.H. [Addition to 784 091] **811 773**

Gelatin films. American Cyanamid Co. **811 940**

Preservation of latex. British Rubber Producers Research Assoc. (Taysum, D. H.), **811 942**

Amines and processes for their preparation. May & Baker, Ltd. [Addition to 768 144] **811 857**

Plasticised linear polyethylene. Distillers Co., Ltd. **811 777**

Production of gases containing sulphur dioxide by stepwise roasting of iron sulphidic ores containing arsenic and/or antimony in fluidised layers with the recovery of roasting residues practically free from arsenic and antimony. Badische Anilin- & Soda-Fabrik A.G. **811 859**

Production of ion exchanger membranes. Farbenfabriken Bayer A.G. **811 789**

Treatment of polymers. Roser G.m.b.H., C. F. **811 946**

Lubricating compositions. Wakefield & Co., Ltd., C. C. **811 860**

Process and apparatus for the production of carbides, more especially titanium carbide. Deutsche Gold- und Silber-Scheideanstalt Vorm. Roessler. **811 906**

Activation of clay by acid treatment, oil ageing and calcination. Minerals & Chemicals Corp. of America. [Addition to 793 393.] **812 010**

Thiocarbaminates bisthiocarbaminates, and bisdithiocarbaminates, methods of producing such substances for treating plants. Philips Gloeilampen-fabrieken N.V. **811 861**

Electrolytic production of titanium. New Jersey Zinc Co. **811 862**

Apparatus for detecting the presence of explosive or combustible gases and vapours. McLuckie, C. **811 716**

Condensation products of epoxidised fatty esters with amine compounds. Coates Bros. & Co. Ltd. **811 797**

Production of telomers from ethylenically-unsaturated compounds. Badische Anilin- & Soda-Fabrik A.G. **811 865**

Dehydro-compounds of the steroid series and process of making same. Organon Laboratories, Ltd. **811 867**

Citrus concentrate product. Union Carbide Corp. **811 798**

Process for preparing alumina and an alumina supported catalyst. Grace & Co., W. R. **811 774**

Process for preparing a gasoline reforming catalyst. Grace & Co., W. R. **811 775**

Treatment of petroleum hydrocarbons with oxygen. British Petroleum Co., Ltd., McNeill, E., and Nathan, W. S. **811 868**

Refractory material. Kaiser Aluminium & Chemical Corp. **811 985, 811 986 & 811 987**

Deodorising spent caustic alkali solutions from a petroleum refining process. Esso Research & Engineering Co. [Addition to 811 869] **811 869**

Preparation of para-nitrobenzoic acid. Aries Associates, Inc. **811 870**

Formation of chemical coatings on metal surfaces. Pyrene Co. Ltd. **812 080**

"VULCAN" BRAND IRON AND STEEL CARBOY HAMPERS SAFETY CRATES, PACKED CARBOYS

HARRIS (LOSTOCK GRALAM) LTD.

LOSTOCK GRALAM, NORTHWICH, CHESHIRE.

Classified Advertisements

CLASSIFIED RATES: All sections 5d. per word. Minimum 8/-. Three or more insertions 4d. per word. Box Number 2/- extra. Up to 10 a.m. Tuesday for insertion same week.
SEMI-DISPLAY: 30/- per inch. Three or more insertions 25/- per inch.
SUBSCRIPTION: Annual Subscription of 52/6 brings 52 weekly copies of CHEMICAL AGE direct to your address from the printer (postage paid by the publishers), and a copy of CHEMICAL AGE DIRECTORY AND WHO'S WHO.
COMPANY MEETINGS AND REPORTS: £12.12.0 per column. Three column measure (approximately 360 words).

BUSINESS OPPORTUNITIES

Advertiser wishes to contact small manufacturing chemists in need of financial assistance to improve their business.

SANSON,
114 Friars Walk, Southgate,
London, N.14

EDUCATIONAL

A.M.I.CHEM.E.—More than one-third of the successful candidates since 1944 have been trained by T.I.G.B. All seeking quick promotion in the Chemical and Allied Industries should send for the T.I.G.B. Prospectus. 100 pages of expert advice, details of Guaranteed Home Study Courses for A.M.I.Chem.E., B.Sc.Eng., A.M.I.Mech.E., A.M.I.Prod.E., C. & G., etc., and a wide range of Diploma Courses in most branches of Engineering. Send for your copy today—**FREE.** T.I.G.B. (Dept. 84), 29 Wright's Lane, London, W.8.

FOR SALE

Brand New **COCHRAN** Vertical and **ECONOMIC** Self-contained **STEAM BOILERS** in stock, also all sizes reconditioned and guaranteed. List on request.
STAINLESS STEEL TANKS, PANS, CONDENSERS, PLATES, VALVES AND COCKS. Very wide selection.
80 gall. S.S. Jacketed Mining Pan, tilting type.
Ten new enamel-lined **ENCLOSED TANKS,** 150/1,000 galls.

FRED WATKINS (ENGINEERING) LTD.,
COLEFORD, GLOS.
Phone: Coleford 2271/2

CHARCOAL, ANIMAL AND VEGETABLE, Horticultural burning, filtering, disinfecting, medicinal. Also lumps, ground and granulated. **THOMAS HILL-JONES, INVICTA WORKS, BOW COMMON LANE, LONDON, E.3 (TELEPHONE: EAST 3285).**

PHONE 98 STAINES
(12) **S.S. (UNUSED) JACKETED PANS**—20 in. by 17 in.
Glass-lined Tanks—800, 1,500 and 1,800 gal.
42 in. Electric Under-drive Hydro—440/3/50.
(9) 750-gal. S.S. Tanks—7 ft. by 3 ft. 3 in.
"JOHNSON" FILTER PRESS—48—36 in. sq. plates. Ditto, 24—25 in. sq. plates.
"Pair" Heavy "U"-Trough Mixers—5 ft. by 2 ft. 3 in. by 2 ft. 6 in. 10 h.p. A.C.
Tanks of all types up to 26,500 gallons.
Pumps, Autoclaves, Condensers, Ovens, etc.
Send for Lists.

HARRY H. GARDAM & CO. LTD.,
100 CHURCH STREET, STAINES.

FOR SALE: continued

600

ECONOMIC BOILERS

TWO—RUSTON & HORNSBY "THERMAX" (Wet Back) treble pass 10 ft. 6 in. dia. by 13 ft. 6 in. long excluding smokebox and flue outlet. Evap. 13,000 lb./hr. 200 p.s.i.
TWO—FOSTER YATES & THOM double pass 9 ft. 9 in. by 15 ft. 6 in. by 20 ft. 6 in. Evap. 12,000 lb./hr. 160 p.s.i.
TWO—JOHN THOMPSON treble pass 9 ft. 6 in. by 14 ft. by 19 ft. Evap. 9,500 lb./hr. 120 p.s.i.
DAVEY PAXMAN double pass 8 ft. by 14 ft. by 18 ft. Evap. 7,050 lb./hr. 120 p.s.i.
THREE—MARSHALL (GAINSBOROUGH) treble pass 8 ft. by 9 ft. 6 in. by 12 ft. Evap. 5,000 lb./hr. 100 p.s.i.
TWO—HARTLEY & SUGDEN treble pass 7 ft. 6 in. by 8 ft. 6 in. by 12 ft. 1 in. Evap. 3,420 lb./hr. 100 p.s.i.

WATER TUBE BOILERS

YARROW type triple drum water tube boiler 6,000/12,500 lb./hr. 400 p.s.i. 1939. Complete with fittings and mountings. 12 ft. 6 in. high by 11 ft. 6 in. by 10 ft. 0 in.
No. 8 FRASER & FRASER water tube boiler. 1946. Evap. 2,500 lb./hr. 120 p.s.i. Suitable for solid or oil fuel.

GEORGE COHEN SONS & CO. LTD.,
WOOD LANE, LONDON, W.12
Tel.: Shepherds Bush 2070
Stanningley, Nr. Leeds.
Tel.: Pudsey 2241.

Unused Stainless Steel **"Z" MIXER**—21 in. by 21 in. by 20 in. Jacketed 50 lb. p.s.i. w.p. Glanded. With reduction gear.
Unused Gardner 4 ft. dia. Double-Cone **MIXER**—20 cu. ft. 5 h.p. T.E. Motor and brake.
Baker-Perkins **'Z' MIXER** 53 in. by 43 in. by 32 in., Electric Tilting, 12½ H.P. A.C. Motor with Speed Reducer.
Hobart 80-qt. (4-speed) and 30-qt. (3-speed) **ELECTRIC CAKE MIXERS.**
REVOLVING DRUM MIXER—6 ft. by 2 ft. 4 in. wide.
Stainless Steel 450-gal. **F.M.B. TANK**—5 ft. by 4 ft. New condition. Available March.
Seite Aluminium **FILTER PRESS,** Beer type—4 chambers 15 in. square on wheeled trolley.
Lying at our No. 2 Depot, Willow Tree Works, Swallowfield, Berkshire.

Apply:
WINKWORTH MACHINERY LTD.,
65 HIGH STREET
STAINES, MIDDLESEX.
(Telephone 1010)

BOX NUMBERS: *Reply c/o "Chemical Age" · Bouverie House · Fleet Street EC4.*

FOR SALE: continued

MORTON, SON AND WARD LIMITED
offer
STAINLESS STEEL VESSELS

One **TANK** 10 ft. by 2 ft. 6 in. dia. totally enclosed, suitable for 20 lb. p.s.i. w.p.
One **CRYSTALIZING PAN** 4 ft. dia. by 1 ft. 6 in. deep, detachable lid, with or without jacket.
Several s.s. **COILS** from 2 ft. to 7 ft. dia.
Assortment of s.s. **VALVES, PLUG COCKS** etc., from ¼ in. to 3 in.
Quantity of s.s. **TUBING** and s.s. **FLANGES.**
All above second hand and in good condition.

NEW UNITS in stainless or mild steel made to requirements.
CONDENSERS,
MIXING VESSELS, JACKETED PANS with or without mixing gear.
'MORWARD' 'U' shaped **TROUGH MIXERS** with or without jackets.
TANKS, CYLINDERS, RECEIVERS, PRESSURE VESSELS and **AUTOCLAVES.**
Stirring gear can be fitted to any vessels.
New **PORTABLE STIRRING UNITS** with clamp-on attachment to requirements.

New **MONO** pumps and other second hand **PUMPS** in stock.
Enquiries invited:
MORTON, SON AND WARD LIMITED,
DOBCROSS, OLDHAM,
Lancs.
Phone Saddleworth 437

Motor-driven 24-in. **AIRSCREW BLOWERS**—4 in. delivery, mounted on channel frame coupled to ¾ h.p. motor 230/250 volts, 3-phase, 50 cycles.
New condition. £20-0-0 to clear.
THOMPSON & SON (MILLWALL) LTD.,
CUBA STREET, MILLWALL,
LONDON, E.14.
Tel.: EAST 1844.

OFFICIAL APPOINTMENTS

SENIOR SCIENTIFIC OFFICERS (a): SCIENTIFIC OFFICERS (b). Pensionable posts for men or women in all major scientific fields, including physics, chemistry, biology, meteorology and mathematics. Age limits: (a) at least 26 and under 31, (b) at least 21 and under 28. Extension for regular Forces Service and Overseas Civil Service. Qualifications: normally first or second class honours degree in science, mathematics or engineering, or equivalent attainment; additionally for (a), at least 3 years' relevant (e.g. post-graduate) experience. London salaries (men): (a) £1,190—£1,410, (b) £635—£1,110; provision for starting pay above minimum. Promotion prospects. Write Civil Service Commission, 17 North Audley Street, London, W.1. for application form, quoting (a) S53/59, (b) S52/59.

PATENTS

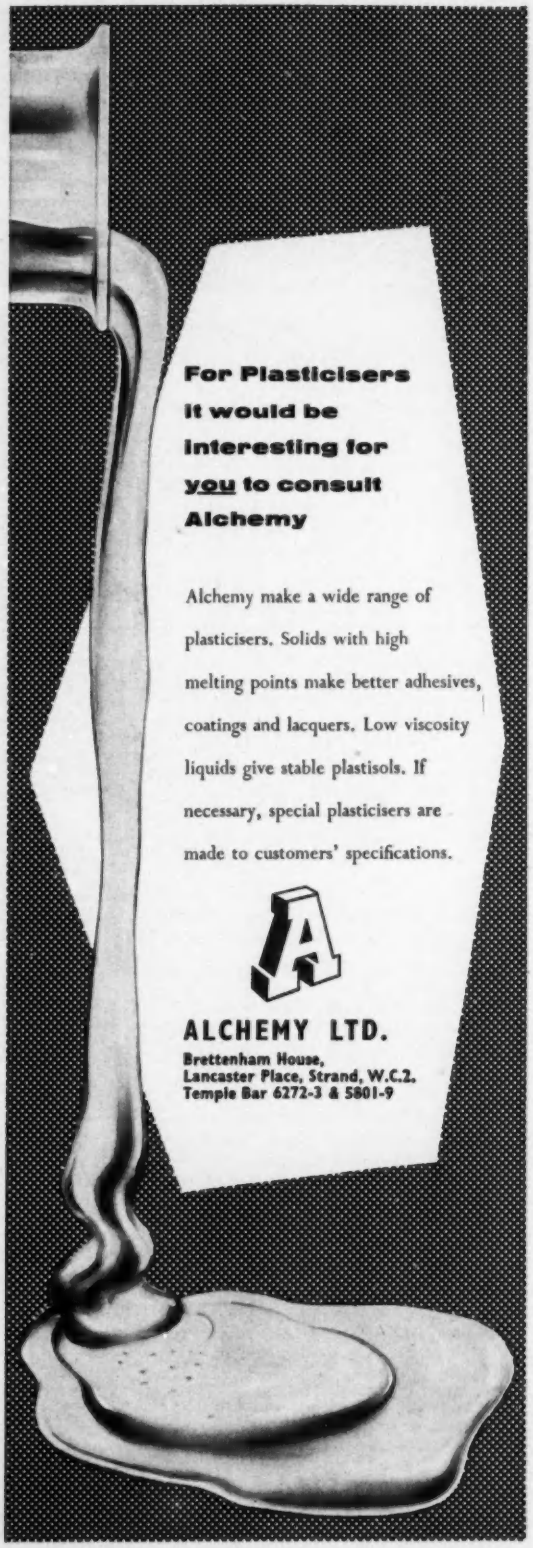
The proprietors of British Patent No. 661470, entitled "Apparatus for Effecting Self-regulated Partial Condensation of Condensible Vapors", offers same for license or otherwise to ensure practical working in Great Britain. Inquiries to: **Singer, Stern & Carlberg, 14 E. Jackson Blvd., Chicago 4, Illinois, U.S.A.**

WANTED

INDUSTRIAL BY-PRODUCTS LTD., 16 Philpot Lane, London, E.C.3, will be pleased to receive particulars of any by-products, waste materials and residues for disposal.

WORK WANTED & OFFERED

CRUSHING, GRINDING, MIXING and DRYING for the trade
THE CRACK PULVERISING MILLS LTD.
Plantation House,
Mincing Lane,
London, E.C.2


For Plasticisers
it would be
interesting for
you to consult
Alchemy
Alchemy make a wide range of plasticisers. Solids with high melting points make better adhesives, coatings and lacquers. Low viscosity liquids give stable plastisols. If necessary, special plasticisers are made to customers' specifications.
ALCHEMY LTD.
Brettenham House,
Lancaster Place, Strand, W.C.2.
Temple Bar 6272-3 & 5801-9

Chemical Age Enquiry Service

For fuller details of equipment, apparatus, chemicals etc., in the advertisement or editorial pages of Chemical Age, fill in the coupons below, ONE PER ENQUIRY, and return to us.

Please send further details about.....
.....
.....
mentioned on page.....*of this issue.*
Name..... *Position*.....
Firm.....
Address .....
.....
Chemical Age Enquiry Service.

Please send further details about.....
.....
.....
mentioned on page.....*of this issue.*
Name..... *Position*.....
Firm.....
Address .....
.....
Chemical Age Enquiry Service.

Please send further details about.....
.....
.....
mentioned on page.....*of this issue.*
Name..... *Position*.....
Firm.....
Address .....
.....
Chemical Age Enquiry Service.

★ *Detach this page complete then fold as marked overleaf to use the post-paid reply folder*

CUT ALONG THIS DOTTED LINE

2nd FOLD

Postage will be paid by the Licensee

No Postage Stamp necessary if posted in Great Britian or Northern Ireland

BUSINESS REPLY FOLDER
Licence No. 2501

CHEMICAL AGE
154-160 FLEET STREET
LONDON, E.C.4

1st FOLD

3rd FOLD

Chemical Age

ENQUIRY SERVICE

★

- *This is a special service for readers of*

  CHEMICAL AGE

- *It is designed to give fuller information on equipment, apparatus, chemicals etc., mentioned in this issue—whether in the editorial text or in an advertisement*

- *Cut out the whole of this page, fold as instructed with post-paid address on the outside*

★

Chemical Age
154 Fleet Street, London, E.C.4
Tel.: Fleet Street 3212

PETROLEUM-DERIVED AROMATIC SOLVENTS AND HYDROCARBON RESIN

SOLVENT AR-395

Boiling range	206-268°C.
Aromaticity	98% by volume

OTHER CUTS AVAILABLE ON REQUEST, INCLUDING BOILING RANGES 177-211°C. & 232-285°C.

PETROLEUM-DERIVED HYDROCARBON RESINS
of high light stability and compatibility with other synthetic resins.
Softening point about 100°C. ASTM method.

ODOURLESS ALIPHATIC SOLVENT
thinner for odourless paints.
Boiling range about 175-210°C.

OTHER PRODUCTS CURRENTLY HANDLED IN BULK AND DRUMS INCLUDE:
N-BUTANOL · ISO-BUTANOL · BUTYL ACETATE · 2-ETHYL—4-METHYL PENTANOL · ETHYLENE GLYCOL

Enquiries to:

CHEMITRADE LTD., 17 STRATTON STREET, LONDON, W.1.

Telephone: GROsvenor 3422 **Cables: Multikem, London.**
Telex: London 28694 Traforchem.

The Chemistry and Physics of Clays and Other Ceramic Materials

ALFRED B. SEARLE and REX W. GRIMSHAW

THE FOURTH AND ENTIRELY RE-WRITTEN edition of this standard work has just been published. The contents include chapters on:
The Nature of Clays and Other Ceramic Materials; Atomic and Crystalline Structure; Crystal Structure of the Silicates; The Crystal Structure of Non-Siliceous Ceramic Materials; The Identification and Estimation of Minerals in Ceramic Materials; The Chemical and Mineralogical Composition of Ceramic Raw Materials; Physical and Structural Properties of Raw Ceramic Materials; The Influence of Water in Ceramic Systems; Changes in the Physical State of Ceramic Materials Brought About by the Removal of Water; The Equilibrium State and Physico-Chemical Reactions; Chemical Changes in Ceramic Materials; Physical Changes in Ceramic Materials; Strength and Allied Properties; Miscellaneous Properties of Ceramic Materials.

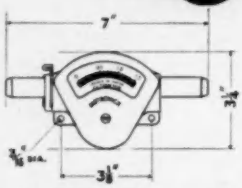
Size: 9¼″×6¼″ · *Illustrated* · 944 *pages* · 126*s. net*

Ernest Benn Limited
BOUVERIE HOUSE · FLEET STREET · LONDON · EC4

... in air-filter inspection

See at a glance with a

METROVICK FILTOMETER



N.B. The FILTOMETER is available in the standard ranges of 0 to 0.5, 0 to 1.5 or 0 to 3 inches of water. Other ranges can be supplied if required.
Send for Publication E.S. 4352/1

This low-priced easily installed instrument—something entirely new on the market—makes the routine inspection of air-conditioning filters quick and easy.

The ordinary method of withdrawing each cell for visual inspection is time-wasting and laborious, cells in good condition often being needlessly removed. With the Filtometer permanently fitted across the filter battery the need for cleaning can be judged by a glance at the dial pointer.

A valuable feature is the finger-operated spring-return valve which safeguards the indicator from being clogged with dust, the valve being open only when a reading is being taken.

METROPOLITAN-VICKERS
ELECTRICAL CO LTD TRAFFORD PARK MANCHESTER 17

An A.E.I. Company (GV)202

ACID & ALKALI
RESISTING LININGS
IN
BRICK, TILE, P.V.C.
&
RUBBER
FOR ALL TRADES

COMPLETE PLANTS
FOR PICKLING
FUME EXTRACTION
&
EFFLUENT
TREATMENT

PICKLING TANKS 90 FEET LONG WORKING SUCCESSFULLY

RIZISTAL

RIZISTAL TRADE MARK

ALL BRITISH GUARANTEED PRODUCTS

MANUFACTURERS
OF
SILICA, LATEX,
CASHEW, FURANE, &
POLYESTER RESIN CEMENTS

SKYMMIT & BRUSH-ON
IMPERVIOUS COATINGS

P.V.C. & STAINLESS STEEL
FABRICATIONS FOR ALL PURPOSES

JOHN L. LORD & SON
WELLINGTON CEMENT WORKS
TELEGRAMS: "CEMENT" PHONE: BURY 617
BURY, LANCASHIRE

Printed in Great Britain by THE PRESS AT COULSDELANDS LTD., Addlestone, Surrey, and published by BENN BROTHERS LTD., at Bouverie House, 154 Fleet Street, E.C.4. Registered at the General Post Office. Entered as Second Class Matter at the New York U.S.A., Post Office.